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Contents

II *Non-legislative acts*

DECISIONS

- ★ **Commission Decision (EU) 2019/61 of 19 December 2018 on the sectoral reference document on best environmental management practices, sector environmental performance indicators and benchmarks of excellence for the public administration sector under Regulation (EC) No 1221/2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) ⁽¹⁾** 1
- ★ **Commission Decision (EU) 2019/62 of 19 December 2018 on the sectoral reference document on best environmental management practices, sector environmental performance indicators and benchmarks of excellence for the car manufacturing sector under Regulation (EC) No 1221/2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) ⁽¹⁾** 58
- ★ **Commission Decision (EU) 2019/63 of 19 December 2018 on the sectoral reference document on best environmental management practices, sector environmental performance indicators and benchmarks of excellence for the electrical and electronic equipment manufacturing sector under Regulation (EC) No 1221/2009 of the European Parliament and of the Council on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) ⁽¹⁾** 94

⁽¹⁾ Text with EEA relevance.

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Acts whose titles are printed in light type are those relating to day-to-day management of agricultural matters, and are generally valid for a limited period.

The titles of all other acts are printed in bold type and preceded by an asterisk.

II

(Non-legislative acts)

DECISIONS

COMMISSION DECISION (EU) 2019/61

of 19 December 2018

on the sectoral reference document on best environmental management practices, sector environmental performance indicators and benchmarks of excellence for the public administration sector under Regulation (EC) No 1221/2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS)

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC ⁽¹⁾, and in particular Article 46 (1) thereof,

Whereas:

- (1) Regulation (EC) No 1221/2009 obliges the Commission to develop sectoral reference documents for specific economic sectors. The documents must include best environmental management practice, environmental performance indicators and, where appropriate, benchmarks of excellence and rating systems identifying environmental performance levels. Organisations registered or preparing to become registered under the eco-management and audit scheme established by that Regulation are required to take those documents into account when developing their environmental management system and when assessing their environmental performance in their environmental statement, or updated environmental statement, prepared in accordance with Annex IV to that Regulation.
- (2) Regulation (EC) No 1221/2009 required the Commission to establish a working plan setting out an indicative list of sectors to be considered priority sectors for the adoption of sectoral and cross-sectoral reference documents. 'Communication from the Commission — Establishment of the working plan setting out an indicative list of sectors for the adoption of sectoral and cross-sectoral reference documents, under Regulation (EC) No 1221/2009 on the voluntary participation of organisations in a Community eco-management and audit scheme (EMAS)' ⁽²⁾ identified the public administration sector as a priority sector.
- (3) Given the variety of activities carried out by the different public administrations across the Union, the sectoral reference document for the public administration sector should focus on the key environmental issues for the sector. It should identify, by way of best environmental management practice for the sector, concrete actions to improve office management, energy and resource efficiency, mobility, land use, air quality, water supply and waste water management, with a view to fostering a more circular economy.
- (4) In order to allow organisations, environmental verifiers and others sufficient time to prepare for introduction of the sectoral reference document for the public administration sector, the date of application of this Decision should be deferred by a period of 120 days from the date of its publication in the *Official Journal of the European Union*.

⁽¹⁾ OJ L 342, 22.12.2009, p. 1.

⁽²⁾ OJ C 358, 8.12.2011, p. 2.

- (5) In developing the sectoral reference document annexed to this Decision, the Commission has consulted with Member States and other stakeholders in accordance with Regulation (EC) No 1221/2009.
- (6) The measures provided for in this Decision are in accordance with the opinion of the Committee established by Article 49 of Regulation (EC) No 1221/2009,

HAS ADOPTED THIS DECISION:

Article 1

The sectoral reference document on best environmental management practices, sector environmental performance indicators and benchmarks of excellence for the public administration sector for the purposes of Regulation (EC) No 1221/2009 is set out in the Annex to this Decision.

Article 2

This Decision shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

It shall apply from 18 May 2019.

Done at Brussels, 19 December 2018.

For the Commission

The President

Jean-Claude JUNCKER

ANNEX

1. INTRODUCTION

This Sectoral Reference Document (SRD) is based on a detailed scientific and policy report ⁽¹⁾ ('Best Practice Report') developed by the European Commission's Joint Research Centre (JRC).

Relevant legal background

The Community eco-management and audit scheme (EMAS) was introduced in 1993, for voluntary participation by organisations, by Council Regulation (EEC) No 1836/93 ⁽²⁾. Subsequently, EMAS has undergone two major revisions:

- Regulation (EC) No 761/2001 of the European Parliament and of the Council ⁽³⁾,
- Regulation (EC) No 1221/2009.

An important new element of the latest revision, which came into force on 11 January 2010, is Article 46 on the development of SRDs. The SRDs have to include best environmental management practices (BEMPs), environmental performance indicators for the specific sectors and, where appropriate, benchmarks of excellence and rating systems identifying performance levels.

How to understand and use this document

The eco-management and audit scheme (EMAS) is a scheme for voluntary participation by organisations committed to continuous environmental improvement. Within this framework, this SRD provides sector-specific guidance to the public administration sector and points out a number of options for improvement as well as best practices.

The document was written by the European Commission using input from stakeholders. A Technical Working Group, comprising experts and stakeholders of the sector, led by the JRC, discussed and ultimately agreed on the best environmental management practices, sector-specific environmental performance indicators and benchmarks of excellence described in this document; these benchmarks in particular were deemed to be representative of the levels of environmental performance that are achieved by the best performing organisations in the sector.

The SRD aims to help and support all organisations that intend to improve their environmental performance by providing ideas and inspiration as well as practical and technical guidance.

The SRD is primarily addressed to organisations that are already registered with EMAS; secondly to organisations that are considering registering with EMAS in the future; and thirdly to all organisations that wish to learn more about best environmental management practices in order to improve their environmental performance. Consequently, the objective of this document is to support all organisations in the public administration sector to focus on relevant environmental aspects, both direct and indirect, and to find information on best environmental management practices, as well as appropriate sector-specific environmental performance indicators to measure their environmental performance, and benchmarks of excellence.

How SRDs should be taken into account by EMAS-registered organisations:

Pursuant to Regulation (EC) No 1221/2009, EMAS-registered organisations are to take SRDs into account at two different levels:

1. When developing and implementing their environmental management system in light of the environmental reviews (Article 4(1)(b)):

⁽¹⁾ The scientific and policy report is publicly available on the JRC website at the following address: <http://susproc.jrc.ec.europa.eu/activities/emas/documents/PublicAdminBEMP.pdf> The conclusions on best environmental management practices and their applicability as well as the identified specific environmental performance indicators and the benchmarks of excellence contained in this Sectoral Reference Document are based on the findings documented in the scientific and policy report. All the background information and technical details can be found there.

⁽²⁾ Council Regulation (EEC) No 1836/93 of 29 June 1993 allowing voluntary participation by companies in the industrial sector in a Community eco-management and audit scheme (OJ L 168, 10.7.1993, p. 1).

⁽³⁾ Regulation (EC) No 761/2001 of the European Parliament and of the Council of 19 March 2001 allowing voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) (OJ L 114, 24.4.2001, p. 1).

Organisations should use relevant elements of the SRD when defining and reviewing their environmental targets and objectives in accordance with the relevant environmental aspects identified in the environmental review and policy, as well as when deciding on the actions to implement to improve their environmental performance.

2. When preparing the environmental statement (*Article 4(1)(d) and Article 4(4)*):

- (a) Organisations should consider the relevant sector-specific environmental performance indicators in the SRD when choosing the indicators ⁽⁴⁾ to use for their reporting of environmental performance.

When choosing the set of indicators for reporting, they should take into account the indicators proposed in the corresponding SRD and their relevance with regards to the significant environmental aspects identified by the organisation in its environmental review. Indicators need only be taken into account where relevant to those environmental aspects that are judged as being most significant in the environmental review.

- (b) When reporting on environmental performance and on other factors regarding environmental performance, organisations should mention in the environmental statement how the relevant best environmental management practices and, if available, benchmarks of excellence have been taken into account.

They should describe how relevant best environmental management practices and benchmarks of excellence (which provide an indication of the environmental performance level that is achieved by best performers) were used to identify measures and actions, and possibly to set priorities, to (further) improve their environmental performance. However, implementing best environmental management practices or meeting the identified benchmarks of excellence is not mandatory, because the voluntary character of EMAS leaves the assessment of the feasibility of the benchmarks and of the implementation of the best practices, in terms of costs and benefits, to the organisations themselves. This feasibility assessment is also necessary for public administrations, which are frequently requested to lead by example.

Similarly to environmental performance indicators, the relevance and applicability of the best environmental management practices and benchmarks of excellence should be assessed by the organisation according to the significant environmental aspects identified by the organisation in its environmental review, as well as technical and financial aspects.

Elements of SRDs (indicators, BEMPs or benchmarks of excellence) not considered relevant with regards to the significant environmental aspects identified by the organisation in its environmental review should not be reported or described in the environmental statement.

EMAS participation is an ongoing process. Every time an organisation plans to improve its environmental performance (and reviews its environmental performance) it shall consult the SRD on specific topics to find inspiration about which issues to tackle next in a step-wise approach.

EMAS environmental verifiers shall check if and how the SRD was taken into account by the organisation when preparing its environmental statement (Article 18(5)(d) of Regulation (EC) No 1221/2009).

When undertaking an audit, accredited environmental verifiers will need evidence from the organisation of how the relevant elements of the SRD have been selected in light of the environmental review and taken into account. They shall not check compliance with the described benchmarks of excellence, but they shall verify evidence on how the SRD was used as a guide to identify indicators and proper voluntary measures that the organisation can implement to improve its environmental performance.

⁽⁴⁾ According to Annex IV (B.e.) of the EMAS Regulation, the environmental statement shall contain 'a summary of the data available on the performance of the organisation against its environmental objectives and targets with respect to its significant environmental impacts. Reporting shall be on the core indicators and on *other relevant existing environmental performance indicators* as set out in Section C'. Annex IV — Section C states that 'each organisation shall also report annually on its performance relating to the more specific environmental aspects as identified in its environmental statement and, where available, take account of sectoral reference documents as referred to in Article 46.'

Given the voluntary nature of EMAS and SRD, no disproportionate burdens should be put on the organisations to provide such evidence. In particular, verifiers shall not require an individual justification for each of the best practices, sector-specific environmental performance indicators and benchmarks of excellence which are mentioned in the SRD and not considered relevant by the organisation in light of its environmental review. Nevertheless, they could suggest relevant additional elements for the organisation to take into account in the future as further evidence of its commitment to continuous performance improvement.

Structure of the Sectoral Reference Document

This document consists of four chapters. Chapter 1 introduces EMAS' legal background and describes how to use this document, while Chapter 2 defines the scope of this SRD. Chapter 3 briefly describes the different best environmental management practices (BEMPs)⁽⁵⁾ together with information on their applicability. When specific environmental performance indicators and benchmarks of excellence could be formulated for a particular BEMP, these are also given. However, defining benchmarks of excellence was not possible for all BEMPs because in some areas either there was limited data available or the specific conditions (local climate, local economy, local society, responsibilities of the public administration, etc.) vary to such an extent that a benchmark of excellence would not be meaningful. Some of the indicators and benchmarks are relevant for more than one BEMP and are thus repeated whenever appropriate. Finally, Chapter 4 presents a comprehensive table with a selection of the most relevant environmental performance indicators, associated explanations and related benchmarks of excellence.

2. SCOPE

This SRD addresses the environmental performance of the activities of the public administration sector. In this document, the public administration sector includes organisations belonging mainly to the following NACE code division (according to the statistical classification of economic activities established by Regulation (EC) No 1893/2006 of the European Parliament and of the Council⁽⁶⁾):

— NACE code 84: Public administration and defence; compulsory social security.

Organisations registered under this NACE code are the target group of this document.

In addition, the best environmental management practices identified in this SRD can be of inspiration also for other organisations, such as public owned companies or private companies delivering services on behalf of public administrations. These may belong, among others, to the following NACE code divisions:

— NACE code 2: Forestry, logging,

— NACE code 36: Water collection, treatment and supply,

— NACE code 37: Sewerage,

— NACE code 38: Waste collection, treatment and disposal activities; materials recovery,

— NACE code 39: Remediation activities and other waste management services,

— NACE code 41.2: Construction of residential and non-residential buildings,

— NACE code 49.3.1: Urban and suburban passenger land transport.

⁽⁵⁾ A detailed description of each of the best practices, with practical guidance on how to implement them, is available in the 'Best Practice Report' published by the JRC and available on-line at: <http://susproc.jrc.ec.europa.eu/activities/emas/documents/PublicAdminBEMP.pdf> Organisations are invited to consult it if interested in learning more about some of the best practices described in this SRD.

⁽⁶⁾ Regulation (EC) No 1893/2006 of the European Parliament and of the Council of 20 December 2006 establishing the statistical classification of economic activities NACE Revision 2 and amending Council Regulation (EEC) No 3037/90 as well as certain EC regulations on specific statistical domains (OJ L 393, 30.12.2006, p. 1).

This SRD targets a number of aspects which are relevant for all types of public administrations, such as the environmental performance of offices, the energy efficiency of public buildings and green public procurement (i.e. Sections 3.1, 3.2.5, 3.2.7, 3.2.8, 3.2.10 and 3.11). All public administrations at local, regional, national and international level are invited to consult these sections of the document.

However, effective environmental management for a public administration needs also to address its core business, where the largest environmental benefits can be achieved. This document aims at easing this task for local authorities and municipalities ⁽⁷⁾ focusing on best practices that are relevant for their role and the services they provide directly or indirectly to their inhabitants (e.g. waste water treatment, local public transport). Local authorities are specifically targeted because they make up the highest share of public administrations in the EU and it is at the local level that there is the highest potential for replicability and learning from best practices.

The main environmental aspects, the associated environmental pressures and the corresponding relevant sections of the document are presented in the table below. The environmental aspects listed were selected as the most relevant in the sector. However, the environmental aspects to be managed by each specific public administration should be assessed on a case-by-case basis. No distinction is made in the table below between direct and indirect environmental aspects, because the operations that are carried out in-house and those that are outsourced vary from case to case. Moreover, many environmental aspects can be considered both direct and indirect, since they refer directly to the activities of the public administration but also to all the activities of residents, companies and organisations in the territory administered or served by the public administration.

The most relevant environmental aspects and pressures for public administrations and how these are addressed in this document

Environmental aspect	Related main environmental pressure	Relevant sections of the SRD
Operate offices	Solid waste generation Water consumption Energy consumption, GHG emissions (CO ₂) Emissions to air (CO, SO ₂ , NO _x , particulate matter, etc.) Resource depletion	Section 3.1
Steer energy use in the territory administered and manage own energy use	Energy consumption, GHG emissions (CO ₂)	Section 3.2
Manage mobility and/or public transport	Emissions to air (CO, SO ₂ , NO _x , particulate matter, etc.) Energy consumption, GHG emissions (CO ₂)	Section 3.3

⁽⁷⁾ In this EMAS SRD, the terms 'local authorities' and 'municipalities' are considered synonyms and refer to the public bodies governing and providing services to citizens at local level.

Environmental aspect	Related main environmental pressure	Relevant sections of the SRD
Plan land use and manage green urban areas	Land use Biodiversity loss	Sections 3.4 and 3.5
Manage ambient air quality and noise	Emissions to air (CO, SO ₂ , NO _x , particulate matter, etc.) Noise generation	Sections 3.6 and 3.7
Waste management	Solid waste generation	Section 3.8
Supply of potable water	Water consumption	Section 3.9
Manage waste water treatment	Emissions to water (BOD, COD, micro-pollutants, etc.) Energy consumption, GHG emissions (CO ₂)	Section 3.10
Procure goods and services	Solid waste generation Water consumption Energy consumption, GHG emissions (CO ₂) Emissions to air (CO, SO ₂ , NO _x , particulate matter, etc.) Resource depletion	Section 3.11
Promote environmental behaviour of residents and businesses	Solid waste generation Water consumption Energy consumption, GHG emissions (CO ₂) Emissions to air (CO, SO ₂ , NO _x , particulate matter, etc.) Emissions to water (COD, BOD, micro-pollutants, etc.) Resource depletion	Section 3.12

The best environmental management practices (BEMPs) described in chapter 3 were identified as the most relevant techniques, actions and measures that public administrations can implement to improve their environmental performance for each of the environmental aspects listed in the table above. In their identification, the specific challenges and opportunities of public bodies, compared to private companies were taken into account. These include, among others:

- more rigid procurement procedures,
- strict funding rules,
- need of longer time periods to implement decisions,

- legacy infrastructure,

- limited budget,

but also:

- the possibility to accept longer term paybacks,

- the possibility to give priority to choices that result in societal benefits rather than financial paybacks,

- stability of staff,

- the opportunities for economies of scale in case of cooperation among different public administration at local, regional or national level.

When considering the implementation of any of the BEMPs presented in this document, local authorities need to consider their specific challenges and how to take advantage of the specific opportunities available ⁽⁸⁾.

3. BEST ENVIRONMENTAL MANAGEMENT PRACTICES, ENVIRONMENTAL PERFORMANCE INDICATORS AND BENCHMARKS OF EXCELLENCE FOR THE PUBLIC ADMINISTRATION SECTOR

3.1. Best environmental management practices for sustainable offices

This section is targeted to all public administrations having office-based operations.

3.1.1. Managing and minimising energy use

It is BEMP to implement energy management according to the principles of the 'plan, do, check, act' cycle in offices owned or managed by the public administration by:

- collecting frequently or monitoring constantly energy use data; data can be collected at building level, per building area (e.g. lobby, offices, canteen/bar), per type of energy source (e.g. gas, electricity) and per end-use category (e.g. lighting, space heating),

- analysing the data, setting targets, identifying benchmarks and using them for comparing actual energy use performance,

- defining a strategy and action plan for the improvement of the energy performance of the office building (see Sections 3.2.5, 3.2.7, 3.2.8).

Applicability

This BEMP is broadly applicable to office buildings owned or managed by public administrations. However, actions that may arise from implementing this BEMP may be more limited in rented buildings.

⁽⁸⁾ The specific challenges and opportunities related to the different BEMPs are addressed either directly in this document or within the practical guidance on how to implement the BEMPs available in the 'Best Practice Report' published by the JRC and available on-line at: <http://susproc.jrc.ec.europa.eu/activities/emas/documents/PublicAdminBEMP.pdf> Organisations are invited to consult it for a better understanding of the best practices described in this SRD.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i1) Total annual energy use per unit of floor area ⁽¹⁾, expressed as final energy (kWh/m²/year). If available, this can also be broken down into: — space heating (kWh/m²/year) — space cooling (kWh/m²/year) — lighting (kWh/m²/year) — other electricity uses (kWh/m²/year) (i2) Total annual energy use per full time equivalent (FTE) employee, expressed as final energy (kWh/FTE/year). If available, this can also be broken down into: — space heating (kWh/FTE/year) — space cooling (kWh/FTE/year) — lighting (kWh/FTE/year) — other electricity uses (kWh/FTE/year) (i3) Total annual primary energy use per floor area or full time equivalent (FTE) employee (kWh/m²/year, kWh/FTE/year) (i4) Total annual greenhouse gas emissions per floor area or full time equivalent (FTE) employee (kg CO₂eq/m²/year, kg CO₂eq/FTE/year)	—

⁽¹⁾ Floor area can be calculated taking into account the useful surface area of the building, for example, the surface used in the energy performance certificates.

3.1.2. Managing and minimising water use

It is BEMP to implement water management according to the principles of the 'plan, do, check, act' cycle in offices owned or managed by the public administration by:

- collecting frequently or monitoring constantly water use data; data can be collected at building level, per relevant building area where water is used (e.g. lobby, offices, canteen/bar), and per end-use category (e.g. restrooms, kitchens),
- analysing the data, setting targets, identifying benchmarks and using them for comparison with actual water use,
- defining a strategy and action plan for the reduction of water use (e.g. installing water efficient taps, showers and pressure reducing valves, regularly maintaining them, installing rainwater harvesting systems).

Applicability

This BEMP is broadly applicable to office buildings owned or managed by public administrations, provided that costs for installation and maintenance of systems for monitoring and collecting water use data are paid back by the expected water savings achievable. In rented buildings, actions that may arise from implementing this BEMP may be more limited.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i5) Total annual water use per full time equivalent (FTE) employee ($\text{m}^3/\text{FTE}/\text{year}$), split into (if relevant): — mains water use ($\text{m}^3/\text{FTE}/\text{year}$) — harvested rainwater use ($\text{m}^3/\text{FTE}/\text{year}$) — recycled greywater use ($\text{m}^3/\text{FTE}/\text{year}$) (i6) Total annual water use per internal floor space ($\text{m}^3/\text{m}^2/\text{year}$), split into (if relevant): — mains water use ($\text{m}^3/\text{m}^2/\text{year}$) — harvested rainwater use ($\text{m}^3/\text{m}^2/\text{year}$) — recycled greywater use ($\text{m}^3/\text{m}^2/\text{year}$)	(b1) Total water use in office buildings is lower than $6,4 \text{ m}^3/\text{full time equivalent employee}/\text{year}$

3.1.3. Managing and minimising waste production

It is BEMP to implement advanced waste management in offices owned or managed by public administrations, based on:

- prevention: establish paperless procedures and archives, ensure durability of equipment and consumables (e.g. via green public procurement, see Section 3.11), enable reuse of office furniture and equipment (e.g. setup of an online inventory of available equipment, furniture and stationery that are no longer needed and ensuring that all services and staff look there before purchasing new items; providing professional cleaning, repair and maintenance to extend lifetime); incentivize staff to use reusable cups instead of single use plastics; provide water fountains (without plastic cups) instead of plastic bottles in meetings or public spaces,
- segregation: easy access to recycling bins for all the most common waste types and establishment of recycling points for all other waste types, in order to minimise residual waste generation; purchase equipment and consumables made with recyclable materials,
- monitoring: regular accounting of quantities of waste generated by waste type, covering all types of waste (e.g. separately collected fractions, residual waste, hazardous waste); this can be achieved thanks to appropriate strategies and the involvement of staff from different services.

Applicability

This BEMP is applicable to all public administrations, and specific to office activity. The specific measure implemented (e.g. the different fractions into which waste is segregated) should reflect the specific conditions (e.g. types of waste generated, local availability of recycling services for particular waste types, local legislation and waste management costs).

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i7) Total annual office waste generation per full time equivalent (FTE) employee (kg/FTE/year)	
(i8) Total annual amount of furniture, equipment and stationery that is reused (kg/FTE/year, EUR of avoided purchase/FTE/year)	(b2) Zero waste generated in the office buildings is sent to landfill
(i9) Office waste sent for recycling as % of total waste by weight (%)	(b3) Total waste generation in office buildings is lower than 200 kg/full time equivalent employee/year
(i10) Residual office waste ⁽¹⁾ as % of total waste by weight (%)	

⁽¹⁾ Residual waste is the waste fraction that is not sent for re-use, recycling, composting or anaerobic digestion.

3.1.4. Minimising the consumption of office paper and consumables

It is BEMP to:

- implement and promote internal procedures (e.g. paperless procedures such as electronic workflows, e-signatures and electronic archives, no printing of documents for meetings, no printing of newsletters/reports, double-side printing as default option) that help employees and the public to avoid the use of office paper (i.e. copier/printer paper) and consumables (i.e. all material such as pens, pencils, highlighters, notebooks used in offices), thereby reducing demand,
- use green public procurement (see Section 3.11) to drive lower impact choices, e.g. low-grammage office paper, longer lasting, refillable products and alternatives with a low environmental impact or low toxicity.

Applicability

This BEMP is broadly applicable to all public administrations.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i11) Daily number of sheets ⁽¹⁾ of office paper used per full time equivalent (FTE) employee (sheets of paper/FTE/working day)	(b4) Office paper consumption is lower than 15 A4 sheets/full time equivalent employee/working day
(i12) Share of environmentally friendly certified office paper purchased in the total purchased office paper (%)	(b5) Office paper used is 100 % recycled or certified according to an ISO Type I ecolabel ⁽²⁾ (e.g. EU Ecolabel)
(i13) Annual cost of office consumables purchased per full time equivalent (FTE) employee (EUR/FTE/year)	

⁽¹⁾ The number of different sizes (e.g. A4, A3) of paper sheets can be converted to an equivalent number of A4 sheets (e.g. one A3 sheet is equivalent to two A4 sheets).

⁽²⁾ As part of the ISO 14000 series of environmental standards, the International Standards Organisation (ISO) has drawn up a subseries (ISO 14020) specific to environmental labelling, which covers three types of labelling schemes. In this context, a 'Type I' ecolabel is a multi-criteria label developed by a third party. Examples are, at EU level, the 'EU Ecolabel' or, at national or multilateral level, the 'Blaue Engel', the 'Austrian Ecolabel' and the 'Nordic Swan'.

3.1.5. *Minimising the environmental impact of commuting and business travel*

It is BEMP to minimise the environmental impact of commuting and business travel by:

- staff engagement and behavioural change towards more sustainable commuting (e.g. campaigns through digital tools, economic incentives/disincentives, use of social games or reward based incentives),
- drawing up of organisation-wide staff travel plans which encourage sustainable modes of commuting and business travel (e.g. agreement with local public transport providers to adapt routes to the needs of commuters; carbon budgeting for business travel),
- including stringent sustainability criteria in the procurement of transport services (e.g. use of train rather than flights for short journeys; preference for direct flights or multimodal journeys over connecting flights),
- reducing commuting by car where public transport exists and encouraging efficient car use (e.g. reducing single passenger car journeys by promoting car-pooling among employees),
- enabling agile working for employees, thus reducing transport needs overall (e.g. introducing remote and home working, installing virtual meeting facilities).

Applicability

This BEMP is applicable across all types and scales of public administrations. However, the specific measures to be implemented vary depending on local conditions, such as geographical setting and availability of public transport.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i14) Implementation of tools for promoting sustainable commuting (y/n)	
(i15) Percentage of staff commuting by car on a daily basis as single passenger (%)	
(i16) Percentage of staff commuting by walking, cycling or public transport at least 3 times per week (%)	(b6) Tools for promoting sustainable commuting for employees are implemented and promoted
(i17) Annual total CO ₂ eq emissions from business travel (tonnes CO ₂ eq/year)	(b7) Carbon budgeting is implemented for all business travel
(i18) Annual total CO ₂ eq emissions from business travel per full time equivalent (FTE) employee (kg CO ₂ eq/FTE/year)	(b8) Videoconferencing facilities are available to all staff and their use is monitored and promoted
(i19) Implementation of carbon budgeting for all business travel (y/n)	
(i20) Availability of videoconferencing facilities to all staff and monitoring and promotion of their use (y/n)	

3.1.6. *Minimising the environmental impact of canteens and coffee bars*

It is BEMP to:

- procure canteen or coffee bar services, or the food and beverages for canteens and coffee bars managed in-house, introducing sustainability requirements such as seasonal, organic food, ensuring availability of vegetarian/vegan options and avoiding (where possible) offering products in single use plastic packaging; choose service providers who can offer services without the use of single use plastic items such as cups, dishes and cutlery (see also Section 3.11),
- conduct staff engagement campaigns promoting sustainable food choices,
- drive behaviour change in canteens and coffee bars by choice of architecture (i.e. changing how options are presented which can make a particular choice the natural or default preference) and pricing policy (i.e. lower price for more sustainable food options),
- implement a reduction of food waste policy by implementing reduced food portions, offer of different sized portions, careful forward planning of menus, etc.

Applicability

This BEMP is applicable across all types and scales of public administration offices that have internal canteen or coffee bar facilities.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i21) Percentage of low-impact food options served (e.g. seasonal, organic) (% of low-impact food out of the total purchase volume)	—
(i22) Amount of food waste generated per meal served (g/meal)	
(i23) Percentage of food waste sent for anaerobic digestion (% sent for anaerobic digestion out of the total tonnes of food waste)	

3.1.7. Minimising the environmental impact of the organisation of meetings and events

It is BEMP to:

- introduce a sustainable event management system; the management system may be implemented by the public administration itself, and/or contractors/suppliers should be sought who have a management system in place; suppliers and hotels can also have an environmental management system (e.g. EMAS),
- communicate to all stakeholders (from suppliers, to delegates and the wider community) and engage with those involved with and/or attending an event on measures they can undertake to reduce the environmental impact of attending the event (e.g. using correct segregated bins, choosing tap water and reusable water bottles, choose sustainable means of transport),
- select the venue of the event or meeting considering environmental criteria (e.g. well-connected by public transport, building with reduced environmental impact, venue with an environmental management system in place),
- choose products and services needed for the organisation of meetings and events implementing green public procurement (see Section 3.11) and limit gadgets and the content of conference packs (e.g. leaflets, pen drives, badges),
- procure catering services, or the food and beverages from catering services managed in-house, introducing sustainability requirements such as seasonal, organic food, ensuring availability of vegetarian/vegan options and avoiding (where possible) offering products in single use plastic packaging; choose service providers who can offer services without the use of single use plastic dishes, cups and cutlery, and make water fountains available instead of water bottles (see also Sections 3.1.6 and 3.11).

Applicability

This BEMP is applicable across all types and scales of public administrations organising meetings and events.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i24) Share of suppliers with a recognised sustainable events management system (e.g. ISO20121) or environmental management system (e.g. EMAS) (%)	—
(i25) Share of event-related tenders including in the criteria a reference to a recognised events management system (e.g. ISO20121) or environmental management system (e.g. EMAS) (%)	

3.2. Best environmental management practices for sustainable energy and climate change

This section is targeted to local authorities, both in their capacity as administration and service providers with a wide range of energy-using direct operations, and in their guiding role for the territory they are responsible for. The BEMPs in this section are divided into four groups:

- policy BEMPs, related to the policy measures that a local authority can put in place to drive sustainable energy, both in-house and in the territory administered, as well as climate change mitigation and adaptation,
- BEMPs regarding direct operations, on how local authorities can reduce energy use and switch to renewable energy in their own buildings and infrastructures,
- BEMPs regarding the regulatory and planning role of municipalities,
- BEMPs on the influence of municipalities on their territory, on the exemplary role that the public sector can play and how local authorities can trigger actions by residents and organisations.

Policy BEMPs

3.2.1. Establishing an inventory of energy use and emissions of the territory of the municipality

It is BEMP to:

- systematically collect energy use and emission data from the territory of the municipality; the scope of the inventory includes energy consumption and emissions across the territory from all sectors, encompassing industry, commerce/services, agriculture, construction, housing and transport,
- publicly report the data collected and use them to identify actions to reduce greenhouse gas emissions in the territory (see Section 3.2.2).

Applicability

This BEMP is applicable to all local authorities.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i26) Total annual carbon emissions of the territory of the municipality: absolute (t CO ₂ eq) and per inhabitant (kg CO ₂ eq/inhabitant)	—
(i27) Annual energy use of the territory of the municipality per inhabitant, expressed as final energy (kWh/inhabitant)	

3.2.2. Establishing and implementing a municipal energy and climate action plan

It is BEMP to establish a municipal energy and climate action plan based on the inventory of energy use and emissions (see Section 3.2.1). The action plan includes science and evidence based short- and long-term targets which can be reached by implementing a number of defined actions (e.g. reduce the energy use of private buildings and businesses, reduce the energy use of municipal buildings and local public services, improve public transport).

Applicability

This BEMP is applicable to all local authorities.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i28) A municipal energy and climate action plan, including targets and actions, is in place (y/n) (i26) Total annual carbon emissions of the territory of the municipality: absolute (t CO ₂ eq) and per inhabitant (kg CO ₂ eq/inhabitant) (i27) Annual energy use of the territory of the municipality per inhabitant, expressed as final energy (kWh/inhabitant)	(b9) A municipal energy and climate action plan, including targets and actions and based on the inventory of energy use and emissions, is in place

3.2.3. Establishing and implementing a strategy for climate change adaptation within the territory of the municipality

It is BEMP to establish a holistic climate change adaptation strategy for the territory of the municipality that allows protecting the built and natural environment against the adverse effects and impacts of climate change (e.g. floods, heat waves, droughts). The climate change adaptation strategy can build on other local and regional adaptation strategies and should ensure that they are linked together. The strategy needs to be coherent with and taken into account by other relevant policies and strategies (e.g. watercourse management plans).

Applicability

This BEMP is applicable to all local authorities. The scope of the adaption strategy should be developed in relation to the specific context of the public administration. The measures contained in the strategy need to respond to the projected climate change impacts on the territory.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i29) A holistic climate change adaptation strategy for the territory of the municipality is in place (y/n) (i30) Percentage of homes and businesses protected as a result of the strategy (%)	(b10) A holistic climate change adaptation strategy for the territory of the municipality is in place

BEMPs regarding direct operations

3.2.4. Implementing energy-efficient street lighting

It BEMP to:

- carry out an audit of the street lighting system,
- improve the luminaires to avoid upward lighting and intrusive lighting and maximise useful lighting,
- reduce lighting levels to actual needs (i.e. avoid overlighting),

- replace lamps selecting highly energy-efficient technologies (e.g. LED) taking into account durability, colour rendering index ⁽⁹⁾ and colour temperature of the light ⁽¹⁰⁾,
- implement night dimming (i.e. reduced lighting late at night),
- introduce intelligent street lighting (e.g. using sensors to temporarily increase the lighting levels when the presence of people is detected).

Applicability

This BEMP is applicable to all public administrations directly or indirectly (through a public or private company) managing the provision of street lighting. The investments required to implement the measures listed may, in some instances, be a limitation and affect the choice of specific measures to implement, but are generally outweighed by the energy savings and result in reasonable payback times.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i31) Annual energy use for street lighting per inhabitant (kWh/inhabitant/year) (i32) Annual energy use for street lighting per kilometre of street lit (MWh/km/year)	(b11) Street lighting energy use per kilometre is lower than 6 MWh/km/year

3.2.5. Improving the energy efficiency of public buildings

It is BEMP to maximise the energy efficiency of public buildings and minimise their energy use. This can be achieved by improving the energy performance and integrity of the building envelope (walls, roof and glazing) and increasing the airtightness, as well as installing energy efficient equipment and commissioning the energy systems.

Both new and existing public buildings can achieve better energy performance than the minimum standards set in the national building codes ⁽¹¹⁾ and be designed or renovated as nearly zero-energy buildings (NZEB) ahead of the EU obligation ⁽¹²⁾.

When defining the measures to improve the energy efficiency of the buildings, not only the energy performance to be achieved, but also the overall environmental impacts over the whole life cycle of the buildings need to be considered ⁽¹³⁾. These can be minimised by, among others, selecting sustainable and low embodied primary energy construction materials, ensuring, at the design phase, easy adaptability to support future re-use of the building and easy renovation (e.g. flexible floor plans) as well as the possibility to deconstruct for re-use and recycling of building materials and elements.

⁽⁹⁾ The colour rendering index of a light bulb specifies the ability for the human eye to distinguish colours under such kind of light. A high colour rendering index is needed in locations where recognising colours well is important.

⁽¹⁰⁾ Light bulbs with a strong white/cold component can have relevant negative impacts on local fauna.

⁽¹¹⁾ Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings (OJ L 153, 18.6.2010, p. 13) (Energy Performance of Buildings Directive, EPBD) requires Member States to set minimum energy performance standards for buildings, which need to be reflected in the national building codes. The Directive introduced a benchmarking system to gradually increase the level of ambition of these energy efficiency requirements, keeping them under regular review.

⁽¹²⁾ The EPBD requires that all new buildings consume very low or nearly zero energy ('nearly zero energy buildings') by 2020 or by 2018 if occupied and owned by public authorities.

⁽¹³⁾ The European Commission is currently piloting a voluntary reporting framework, Level(s), for measuring the overall sustainability performance of buildings throughout their life cycle. More info available at: <http://ec.europa.eu/environment/eussd/buildings.htm>

Applicability

This BEMP is applicable to all public administrations provided that they can commit the required financial resources for improving the energy efficiency of public buildings. This BEMP may be more difficult to implement in rented properties. Additionally, the level of energy performance that can be achieved in each specific case will be affected by the characteristics of the building (e.g. old building).

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i1) Total annual energy use per unit of floor area, expressed as final energy (kWh/m ² /year)	(b12) For newbuilds, the building is designed with a total primary energy use (including all uses) lower than 60 kWh/m ² /year
(i33) Total annual primary energy use per unit of floor area (kWh/m ² /year)	(b13) For existing buildings undergoing renovation, the building is designed with a total primary energy use (including all uses) lower than 100 kWh/m ² /year

3.2.6. Improving the energy efficiency of social housing

It is BEMP to improve the energy efficiency of social housing, both for existing buildings undergoing renovation and new buildings, as described above for public buildings (see Section 3.2.5). For social housing, it is BEMP to involve local residents in the process of planning the renovation or designing the new building, in order to take into account their needs and engage them in the benefits of nearly zero energy buildings and how to use them.

Applicability

This BEMP is applicable to public administrations that manage social housing. The amount of investment needed may prove a relevant barrier to its implementation. However, the relevant social benefits (improved welfare, reduced fuel poverty) and financial benefits (energy savings if energy costs are centrally paid, or a higher proportion of tenants paying their rent if they are responsible for their own energy costs) outweigh the investments.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i1) Total annual energy use per unit of floor area, expressed as final energy (kWh/m ² /year)	(b12) For newbuilds, the building is designed with a total primary energy use (including all uses) lower than 60 kWh/m ² /year
(i33) Total annual primary energy use per unit of floor area (kWh/m ² /year)	(b13) For existing buildings undergoing renovation, the building is designed with a total primary energy use (including all uses) lower than 100 kWh/m ² /year

3.2.7. Achieving energy efficiency in public buildings through energy performance contracts

It is BEMP to implement energy performance contracts for public buildings. The public administration appoints an energy service company (ESCO) in order to identify appropriate energy efficiency improvements for public buildings, develop them, put them in place, provide a guarantee that a set level of energy savings will be achieved, take responsibility for the risk of the investment and, in many cases, arrange financing to pay for the projects. This allows public administrations to improve energy efficiency in public buildings without the need to fund the investment costs upfront.

Two types of energy performance contracts exist:

- shared-savings contracts, where the ESCo and the public administration share the cost savings at a predetermined percentage for a fixed number of years,
- guaranteed-savings contracts, where the ESCo guarantees a certain level of energy savings for the public administration, which receives a cheaper energy bill. However, the real savings are higher than the guaranteed ones and the ESCo earns the difference.

Applicability

All public administrations can apply energy performance contracting for introducing improvements to energy efficiency in their buildings. This is specifically relevant for public administrations and/or projects where otherwise it would be difficult to make the necessary investment because of lack of financial capacity or energy efficiency technical and management capacity.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i34) Percentage of the total energy use of the public administration covered by energy performance contracts (%)	—

3.2.8. Improving the energy performance of existing public buildings through monitoring, energy management and fostering of behavioural change

It is BEMP to:

- train key staff with direct responsibility for building and energy management in energy efficiency; the training needs to include theoretical and practical sessions supported by proper manuals and guides,
- engage all staff in actions that influence energy use (e.g. switch off lights, set a correct room temperature), focusing specifically on well-respected and influential members of staff (e.g. behaviour change champions),
- plan and run behaviour change campaigns to drive energy efficiency across the public administration; firstly, the target audience of each campaign needs to be identified and then specific energy-efficient actions can be properly promoted among the targeted staff,
- adopt Energy Performance Certificates and Display Energy Certificates, which rate the energy performance of a building, in order to display them prominently in the building or to use them as an engagement tool in specific awareness-raising campaigns.

Applicability

This BEMP is applicable to all public administrations.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i1) Total annual energy use per unit of floor area, expressed as final energy (kWh/m ² /year)	—
(i35) Percentage of staff engaged and who continue to be engaged one year after the launch of an awareness campaign (%)	
(i36) Hours of environment-specific training provided per full time equivalent (FTE) employee and year (hours/FTE/year)	

3.2.9. Implementing district heating and/or district cooling networks

It is BEMP to implement district heating networks and/or district cooling networks to provide public buildings and/or households with, respectively, space heating and hot water or space cooling. By generating them in central units, the heating and/or cooling provided to the network can be sourced from combined heat and power systems or tri-generation plants. When possible, further environmental benefits can be obtained by running these systems on renewable biomass or by employing geothermal energy or waste heat from industrial plants.

Applicability

This BEMP is applicable to all local authorities. It is specifically relevant for newly built areas and major renovations of public building complexes or other public infrastructures (e.g. swimming pools). There are some limitations for low-density populated areas and where heating and cooling demand fluctuates considerably.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i37) Annual CO ₂ emissions of the system providing heating or cooling, before and after the implementation of district heating/cooling as an absolute figure or per unit of floor area of the buildings heated or cooled (t CO ₂ eq, kg CO ₂ eq/m ²)	—

3.2.10. Implementing on-site renewables and mini-combined heat and power (CHP) systems in public buildings and social housing

It is BEMP to provide public buildings and social housing with low-carbon technologies to meet the energy demand. These can include solar thermal systems for heat generation, on-site photovoltaic panels for electricity generation, or, in case of sufficient heat demand, small-scale combined heat and power (mini-CHP) systems to jointly generate the heat and the electricity at a higher overall efficiency. Mini-CHP systems can run on gas, or have additional environmental benefits if run on biomass where a local source of sustainable biomass is available.

Applicability

This BEMP is applicable to all public administrations. However, the possibility to implement specific solutions may be limited by the local availability of renewable energy sources and the financial investment required.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i38) On-site renewable energy generation per unit of floor area (kWh/m ² year)	
(i39) Share of total energy use met by on-site renewables (%)	(b14) 100 % of the electricity used in a public building is met by on-site generation of renewable electricity
(i40) Share of total energy use met by on-site generation of low-carbon energy (%)	(b15) 100 % of the hot water demand in a public building/ social housing building is met by on-site renewable heat generation
(i41) Share of total electricity use met by on-site generation of renewable electricity (%)	
(i42) Percentage of hot water demand met by on-site renewable heat generation (%)	

BEMPs regarding the regulatory and planning role of municipalities

3.2.11. *Setting higher energy efficiency standards and renewable energy requirements in land use planning for newbuilds and buildings undergoing major renovations through local building regulations, urban planning and building permits*

It is BEMP to introduce in the local planning system the provision that newbuilds and renovations within the territory are carried out to exemplary energy standards (i.e. high energy efficiency and integration of renewable energy generation). Local autonomy enables most municipalities to go beyond the energy standards and renewable energy requirements set by national legislation and implement positive changes at the local level. The requirements introduced in the local planning system can be regularly updated following the developments of the construction industry and new national targets.

It is also BEMP to consider energy performance and integration of renewables in urban planning and building permits to require and/or encourage organisations and residents to adopt sustainable energy solutions.

Applicability

This BEMP is applicable to all local authorities with a role in setting the local building code and/or in providing building permits. However, national legislation may pose limitations on what they can require.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i43) Establishment of regulations setting higher energy efficiency standards and renewable energy requirements (y/n)	—
(i44) Level of energy performance required by the local building code (kWh/m ² /year)	
(i45) Systematic consideration of energy performance and integration of renewables in the processing of building permits (y/n)	

BEMPs on the influence of municipalities on their territory*3.2.12. Exemplary role of the public sector*

It is BEMP to:

- show ambition by exceeding existing national or international targets for the local authority's own energy use and for the energy use of its territory, with a firm commitment from the highest levels of the municipality and the engagement of the other relevant stakeholders,
- lead by example: the municipality can implement exemplary measures and achieve exemplary energy performance levels, both to demonstrate that it is possible and to foster the local market for sustainable energy solutions; the municipality can also deliver flagship projects to showcase the public authority's commitment to sustainability,
- communicate effectively to the general public: the public administration needs to be seen to be delivering the ambition in order to encourage other stakeholders to follow suit,
- support the creation of incentives schemes: create local schemes to finance residents in their actions to reduce their environmental impact,
- help overcome institutional barriers for the adoption of sustainable energy solutions.

Applicability

This BEMP is applicable to all local public administrations.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i46) Delivery of flagship and demonstration projects (y/n)	—
(i47) Achievement of an ambitious level of energy performance across all buildings and activities of the public administration (y/n)	

3.2.13. Information and advice services on energy efficiency and renewable energy for citizens and businesses and set up of public-private partnerships

It is BEMP to:

- adopt strategic partnerships to involve the wider community in the development and delivery of carbon reduction schemes,
- establish information and advice services to help residents and businesses reduce their energy use,

- set up and join public-private energy-related projects: public administrations can partner with private organisations with specialised knowledge in energy efficiency and renewable energy projects,
- support low-carbon pilot projects: pilot projects can help bring to the market energy efficiency and renewable energy solutions with the potential to be replicated by organisations and citizens in their territory.

Applicability

This BEMP is applicable to all public administrations with a role in promoting energy efficiency and/or renewable energy for residents and businesses.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i48) The public administration delivers information and advice services on energy efficiency and renewable energy (y/n)	—
(i49) The public administration supports low-carbon pilot projects, e.g. through public-private partnerships (y/n)	

3.2.14. Thermographic surveying of the built environment in the territory of the municipality

It is BEMP to use thermography to collect data at various scales and to provide visual information on heat radiation, in order to understand where energy efficiency solutions need to be deployed as a priority and to engage residents and local organisations on the energy efficiency of buildings. A thermographic survey of a large area can be carried out by aerial thermography.

Applicability

This BEMP is applicable to local authorities. The thermographic survey needs to be performed under specific conditions in terms of climate (i.e. temperature, wind), period of the year (i.e. winter) and time of the day (i.e. early morning).

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i50) Percentage of the built area of the territory of the municipality covered by thermographic surveying (%)	(b16) Recent (< 5 years) high-resolution (< 50 cm) thermographic data is available for 100 % of the built area in the territory of the municipality
(i51) Potential energy savings identified thanks to the analysis of the thermographic survey (kWh/year, EUR/year)	

3.3. Best environmental management practices for mobility

This section is targeted to public administrations responsible for mobility and/or public transport in their territory.

3.3.1. Enacting a sustainable urban mobility plan

It is BEMP to adopt a Sustainable Urban Mobility Plan (SUMP) in order to provide an integrated approach to all modes of transport while taking into account planning for the surrounding environment. The SUMP aims to improve safety and security, reduce air and noise pollution, lower emissions and energy consumption, improve the efficiency and cost-effectiveness of transportation and enhance the attractiveness and quality of the urban environment and urban design. The following sections (3.3.2 to 3.3.9) describe measures that can be included in a SUMP.

Applicability

This BEMP is applicable to all public administrations responsible for mobility and/or public transport. Local and contextual factors may influence the specific measures that can be included in the SUMP and their applicability.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i52) Modal share of journeys (% of journeys made by car, motorbike, public transport, cycling and walking)	—
(i53) Accessibility of public transport (share of inhabitants living within 300 metres of an urban public transport stop with a minimum frequency of 15-20 minutes) (%)	

3.3.2. Fostering cycling and walking through cycling infrastructure, bike-sharing schemes and promotion of walking

It is BEMP to:

- adopt policy measures and strategies to foster cycling and walking; cycling and walking need to be well recognised as separate modes of transport in policy and planning documents and strategic plans of the city, with specific measures for each of them,
- establish an efficient infrastructure; walking and cycling infrastructures are needed in order to make walking and cycling safe, fast and attractive,
- apply methodological tools in order to systematically collect data on walking and cycling; following the development of walking and cycling and evaluating the effect of the measures implemented can support further decision making and choices to promote sustainable transport,
- develop effective and targeted communication tools promoting walking and cycling among residents and commuters.

Applicability

This BEMP is applicable to all public administrations responsible for mobility. However, some local and contextual factors (e.g. topography) may limit the applicability of specific measures supporting and promoting walking and cycling.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i52) Modal share of journeys (% of journeys made by car, motorbike, public transport, cycling and walking) (i54) Length of cycling infrastructure (cycle lanes, cycle tracks), in total (km) and in relation to the length of the total road network for vehicles (km of cycle lanes/km of roads) (i55) The city has a dedicated policy or plan for investment in walking/cycling infrastructure and measurable goals to increase walking/cycling that are politically adopted (y/n)	(b17) The city has a modal split for cycling of 20 % or higher OR the city has increased its modal split for cycling by at least 50 % during the last five years. (b18) At least 10 % of the city's investment in transport infrastructure and maintenance is dedicated to cycling infrastructure.

3.3.3. Implementing a large-scale car-sharing scheme

It is BEMP to support and encourage the creation of a large car-sharing scheme in the territory of the municipality. Car-sharing services are not generally run by the city in which they operate; however, the municipality can set up supportive infrastructure, establish appropriate policy and legislation to integrate car sharing into the city fabric and with public transport. The public administration can also become a business customer of the local car-sharing service, create public awareness, promote the service and establish standards that car-sharing operators must meet in order to be able take advantage of the city's supportive infrastructure (e.g. preferential lanes, low-traffic zones). Cities may also decide to subsidise a car-sharing operator to expand or accelerate the rate of growth.

Applicability

This BEMP is particularly relevant for local authorities with an urban territory with more than 200 000 inhabitants. Local authorities of territories with a lower population may encounter limitations in the applicability of the BEMP due to the limited number of customers of the car-sharing scheme, higher costs, less-developed public transport network, etc.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i56) Number of car-sharing users per 10 000 inhabitants (number/10 000 inhabitants) (i57) Number of registered users per car-share vehicle (number of users/number of vehicles) (i58) Number of inhabitants per shared car available (number of inhabitants/number of vehicles) (i59) Mileage driven annually by car-sharing users (km/user/year) (i60) Number of privately owned cars replaced by each vehicle in a car-sharing operator's fleet (number of privately owned cars replaced/number of car-shared vehicles)	(b19) At least 8 privately owned cars were replaced by each vehicle in the car-sharing operator's fleet (b20) At least 1 shared car available per 2 500 inhabitants

3.3.4. Integrated ticketing for public transport

It is BEMP to introduce integrated ticketing in the form of a smart system with the capability of identifying and charging for trips which use multiple modes of transport. If the public administration acts as a public transport operator (e.g. through a city-owned subsidiary company) it can implement the integrated ticketing itself. In cases where the municipality awards public transport services to private companies, the integrated ticketing solutions can be required in the tender.

Applicability

This BEMP is applicable to all public administrations responsible for public transport. However, below a certain critical mass of users and annual transactions, it can be challenging to recoup the initial investments in terms of the time and finances needed to implement a smart integrated ticketing system.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i61) Percentage of trips paid for by the integrated ticket (%)	
(i62) Number of public transport users who would have used private motorised transportation in the absence of an integrated ticketing system (normalised by total population in the catchment area)	(b21) At least 75 % of trips are paid for by the integrated ticket

3.3.5. Improving the uptake of electric vehicles in urban areas

It is BEMP to purchase electric vehicles (i.e. electric cars, mopeds and bikes) for the public administration's own fleet. Additionally, schemes that support the purchase of electric vehicles by residents can also be put in place, devoting some budget or reaching agreements with local banks for reduced interest rates. Moreover, public administration can support the uptake of electric vehicles by allowing their circulation in restricted traffic areas or in preferential lanes, creating or increasing the number of public charging points, reducing electric vehicles' taxation, introducing or supporting electric vehicle car-sharing schemes and advertising to residents the support measures for electric vehicles.

Applicability

This BEMP is applicable to all local authorities and particularly relevant in cities (with a large share of short driving distances) and areas with problems of traffic congestion and air pollution.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i63) Percentage of electric vehicles (per type, e.g. e-cars, e-bikes) on the road compared to total vehicles (%)	—
(i64) Percentage of electric public vehicles (per type, e.g. e-cars, e-bikes) within the total public vehicle fleet (%)	
(i65) Number of public charging points per inhabitants (number/inhabitants)	

3.3.6. *Fostering passenger intermodality*

It is BEMP to encourage the development of convenient, safe, fast and seamless connections among sustainable modes of transport. Intermodal transport systems link together the infrastructure and services for public transport (buses, trams/light rail and commuter rail), walking, biking, bike sharing, and car sharing. Public administrations can foster passenger intermodality by cooperating with various public transport operators and bike- and car-sharing companies.

Applicability

This BEMP is applicable to all local authorities but particularly relevant for cities with complex transport networks and an extended territory.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i52) Modal share of journeys (% of journeys made by car, motorbike, public transport, cycling and walking)	(b22) The share of sustainable modes of transport used in the city (e.g. walking, cycling, bus, tram, train) is 60 % or higher
(i66) Average number of bicycle park spaces at public transport stops per average daily passenger throughput (number of bicycle park spaces/number of passengers)	
(i67) Percentage of public transport users who combine it with walking/cycling out of the public transport users who live within a reasonable radius (800 m for walking and 3 km for cycling) of high-frequency (at least twice per hour during morning and evening rush hours) public transport stops (%)	
(i68) Intermodal journey-planning software available to the inhabitants includes walkable and cycleable journey legs (y/n)	

3.3.7. Implementing a congestion charge

It is BEMP to implement a congestion charge in city areas with high traffic congestion. The congestion charge is an economic disincentive (fee) to the use of congested roads at the busiest times of the day. In order to be successful, the congestion charge needs to be implemented as part of a package of transport measures (see previous BEMPs in Section 3.3) that provide a valid alternative to the use of a car.

Applicability

This BEMP is applicable to local authorities in urban areas with high traffic congestion and air pollution.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i52) Modal share of journeys (% of journeys made by car, motorbike, public transport, cycling and walking)	(b23) The concentration of air pollutants (PM ₁₀ , ammonia and nitrogen oxide) is reduced by 10 % (on average) within the congestion charge area, compared to the situation before the introduction of the congestion charge
(i69) Percentage of reduction in air pollutants (particulate matters — PM ₁₀ , ammonia and nitrogen oxide) within the congestion charge area, compared to the situation before the introduction of the congestion charge (%)	(b24) Vehicular access of non-exempt vehicles to the congestion charge area is reduced by 20 % compared to the situation before the introduction of the congestion charge
(i70) Percentage of reduction in vehicular access of non-exempt vehicles to the congestion charge area compared to the situation before the introduction of the congestion charge (%)	(b25) The speed and punctuality of public transport services are improved by 5 % compared to the situation before the introduction of the congestion charge
(i71) Percentage of increased average speed and punctuality of public transport vehicles in the congestion charge area compared to the situation before the introduction of the congestion charge (%)	

3.3.8. Limiting free parking spaces in cities

It is BEMP to limit on-street free parking spaces (i.e. free of charge) in urban areas and remove minimum parking requirements (for on-street parking and underground garages) in new building developments. Additionally, a formal policy to incrementally remove any previous parking requirements (for on-street parking and underground garages) from existing developments can also be adopted. Limiting on-street free parking spaces is a disincentive to privately owned cars. These measures are most effective when accompanied by measures to improve the availability and reliability of valid alternatives to the use of a car, such as public transport, cycling and walking.

Applicability

This BEMP is applicable to all local authorities and specifically relevant for cities with high traffic congestion and air pollution or underused public transport.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i52) Modal share of journeys (% of journeys made by car, motorbike, public transport, cycling and walking)	(b26) On-street parking spaces are between 80 % and 90 % occupied during 90 % of business hours
(i72) Percentage of available parking spaces during business hours (%)	(b27) The city has no minimum parking requirements (for on-street parking and underground garages) for new developments and has a formal policy to incrementally remove any previous parking requirements from existing developments
(i73) Existence of minimum parking requirements (for on-street parking and underground garages) for new developments (y/n)	

3.3.9. Implementation of logistics service centres

It is BEMP to involve the relevant stakeholders and support the implementation of a logistics service centre in the territory of the municipality. The logistics service centre can be situated in relatively close proximity to the geographical area that it serves, to allow consolidated deliveries to be carried out within that area.

Applicability

This BEMP is applicable to all local authorities responsible for mobility and specifically relevant for cities which receive a high volume of deliveries of goods and/or are subject to high traffic congestion and air pollution.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i74) Emissions of CO ₂ from delivery vehicles over a specific timespan (e.g. yearly, monthly) in the area served by the logistics service centre (kg CO ₂ eq/year or kg CO ₂ eq/month)	(b28) 40 % reduction in CO ₂ emissions from delivery vehicles in the service area compared to the situation before the implementation of the logistics service centre
(i75) Number of delivery trips per day in the service area (number/day)	(b29) 75 % reduction in the number of delivery trips per day to the service area compared to the situation before the implementation of the logistics service centre

3.4. Best environmental management practices for land use

This section is targeted to local authorities responsible for land use planning.

3.4.1. Limiting urban sprawl into green spaces and agricultural land

It is BEMP to limit and control urban sprawl by regulatory measures (e.g. spatial land use planning, restriction on specific land use), economic intervention (e.g. trading in building permits) and institutional change and management (e.g. special agencies for urban revitalisation). Examples of measures to limit urban sprawl are encouraging building on brownfield land, minimising sealed space between buildings, renovating unused buildings, and promoting vertical development.

Applicability

This BEMP is applicable to all local authorities responsible for land use planning.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i76) Percentage of manmade impermeable surfaces (i.e. any kind of impermeable built area: buildings, roads, any part with no vegetation or water) in the territory of the municipality (km ² manmade impermeable surface/km ² total surface)	—
(i77) Percentage of new built area in a specific time span (e.g. 1, 5, 10 years) out of the total built area in the territory of the municipality at the beginning of the period considered (%)	—

3.4.2. Reducing the urban heat island effect

It is BEMP to mitigate the urban heat island effect through the implementation of a combination of measures, such as green areas, green roofs, the use of reflective materials, increasing the efficiency of the insulation of hot pipes and avoiding the dissipation of waste heat by its reuse.

Applicability

This BEMP is applicable to all local authorities responsible for land use planning in large urban areas. Small municipalities are less affected by the urban heat island effect.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i78) Implementation of measures to mitigate the urban heat island effect, such as green areas, green roofs or use of reflective materials (y/n)	—

3.4.3. Requiring low-impact water drainage in sealed soils

It is BEMP to require low-impact drainage measures in the construction of new developments (including major redevelopments of existing built areas) to prevent and control flooding, soil erosion and pollution, and groundwater pollution. Low-impact drainage measures adopting the 'Sustainable Drainage Systems' (SUDS) philosophy are considered best practice, as SUDS follow outstanding principles which:

- seek the improvement of water run-off quality, reduce surface run-off, contribute to biodiversity and create amenity value,
- try to replicate, as closely as possible, the natural drainage before development,
- have an integrated management hierarchy of prevention, source control and site control.

Applicability

This BEMP is applicable to all local authorities responsible for land use planning. The specific measures to improve water drainage are site-specific.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i79) Existence of requirements for low-impact drainage measures for the construction of new developments and for major redevelopments (y/n)	—

3.5. Best environmental management practices for green urban areas

This section is targeted to public administrations responsible for the management of green urban areas.

3.5.1. Establishing and implementing a local biodiversity strategy and action plan

It is BEMP to introduce a local biodiversity strategy and action plan whose goals and objectives can be defined thanks to dialogue with experts, stakeholders and residents. The action plan needs to include the measures to be implemented, timelines, budget available, milestones, partnerships for implementation and responsibilities. The results of the action plan can be promoted and disseminated to inhabitants and stakeholders to raise awareness.

Applicability

This BEMP is applicable to all public administrations responsible for the management of green urban areas.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i80) Percentage and number of native species (for different categories of species, e.g. birds, butterflies) in the urban area (%)	—
(i81) Percentage of natural and semi-natural areas in the urban area out of the total urban area (%)	
(i82) Green space per inhabitant (m ² /inhabitant) — distinguishing between urban, semi-urban and rural areas	

3.5.2. Creating blue-green networks

It is BEMP to develop blue-green networks ⁽¹⁴⁾, recreating a nature-oriented water cycle and contributing to the amenity of the city, by bringing water management and green infrastructure together. Blue-green networks can combine and protect the hydrological and ecological values of the urban landscape while providing resilient and adaptive measures to deal with flooding events.

Applicability

This BEMP is applicable to all local authorities.

⁽¹⁴⁾ Blue-green networks are natural and semi-natural areas incorporating green spaces (and/or blue if and when aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i83) Percentage of green and blue urban areas in the urban area out of the total urban area (%)	—

3.5.3. *Fostering the deployment of green roofs*

It is BEMP to develop appropriate policy schemes that support the construction of green roofs in new and existing buildings, both public and private. Green roofs can also host renewable energy systems, such as photovoltaic panels (see Section 3.2.10 for more information on renewable energy generation in public buildings and social housing). Policy schemes that support the deployment of green roofs can incorporate economic incentives, reduced bureaucracy, and specific technical support for inclusion of green roofs in the construction or renovation of buildings.

Applicability

This BEMP is applicable to all local authorities responsible for land use planning.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i84) Percentage of surface covered with green roofs out of the total surface of the urban area ($\text{m}^2_{\text{green roof}} / \text{m}^2_{\text{urban area}}$)	—
(i85) Percentage or number of buildings with green roofs in a given urban area (%)	

3.5.4. *Giving new environmental value to derelict green areas and fringe areas*

It is BEMP to adopt a plan to restore derelict green areas and fringe areas in the territory of the municipality in order to remove pollutants from soil and water, improve the habitat for wildlife, reduce the urban heat island effect and protect against soil erosion and floods, while offering recreational green areas for the local residents.

Applicability

This BEMP is applicable to all local authorities responsible for land use planning.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i86) Adoption of a plan for the restoration and environmental management of the derelict green areas and fringe areas within the urban area (y/n)	—

3.6. **Best environmental management practices for local ambient air quality**

This section is targeted to public administrations responsible for the management of air quality.

3.6.1. Improving local ambient air quality

It is BEMP to have a structured plan to improve air quality with regularly updated goals, both short-term and long-term, set in advance and going beyond the target and limit values set in Directive 2008/50/EC of the European Parliament and of the Council ⁽¹⁵⁾ (the Air Quality Directive). The plan needs to encompass all aspects starting with transport (car use, speed limits, public transport, etc.), industrial installations, energy production, type of heating systems in buildings, energy efficiency of buildings and land use planning and needs to be developed in cooperation with the relevant sectoral authorities and stakeholders. Moreover, where applicable, the effectiveness of the plan can be enhanced by developing it in coordination with higher level public authorities and neighbouring municipalities. The plan to improve air quality can also include dissemination of information to residents about the effects and importance of air quality, by, for instance, promoting the use of sustainable transport options.

Applicability

This BEMP is applicable to all public administrations responsible for the management of air quality in their territory, targeting specific local issues.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i87) Annual average PM ₁₀ concentration (µg/m ³) (i88) Annual number of days when the daily average PM ₁₀ concentration exceeds the value of 50 µg/m ³ (days/year) (i89) Annual average PM _{2,5} concentrations (µg/m ³) (i90) Annual number of days when the daily average PM _{2,5} concentration exceeds the value of 25 µg/m ³ (days/year) (i91) Annual number of days when ozone (O ₃) concentration exceeds the value of 120 µg/m ³ of maximum daily 8-hour mean (days/year) (i92) Annual average nitrogen dioxide (NO ₂) concentration (µg/m ³) (i93) Annual number of days when the hourly NO ₂ concentration exceeds the value of 200 µg/m ³ (days/year)	(b30) For all the indicators defined in this BEMP, the results achieve the levels set in the air quality guidelines produced by the World Health Organisation

3.7. Best environmental management practices for noise pollution

This section is targeted to public administrations responsible for tackling noise pollution.

3.7.1. Monitoring, mapping and reducing noise pollution

It is BEMP to map noise in the territory of the municipality and to inform the public about the effects of noise pollution and the results of the mapping through an effective communication campaign. Based on the results of the noise mapping, the local authorities need to create noise action plans to reduce local noise levels and maintain environmental noise quality in areas where it is good.

⁽¹⁵⁾ Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe (OJ L 152, 11.6.2008, p. 1).

Applicability

This BEMP is applicable to all public administrations responsible for tackling noise pollution.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i94) Percentage of noise level measurements exceeding local limit values out of the total number of measurements (%)	—
(i95) Residents exposed to noise levels exceeding local limit values out of the total population (%)	
(i96) Residents exposed to night-time noise levels affecting health according to World Health Organisation limits out of the total population (%)	

3.8. Best environmental management practices for waste management

This section is targeted to public administrations in charge of waste management.

3.8.1. Taking into account the EMAS Sectoral Reference Document for the waste management sector

It is BEMP to consider the Best Environmental Management Practices identified and presented in the EMAS Sectoral Reference Document for the waste management sector⁽¹⁶⁾ and to report on the indicators provided in that document.

Applicability

This BEMP is applicable to all public administrations in charge of waste management.

3.9. Best environmental management practices for water supply

This section is targeted to public administrations responsible for supplying potable water in their territory.

3.9.1. Deploying full water metering at the household/final user level

It is BEMP to install water meters for each residential unit and any other individual final user (industrial plant, commercial building, public building, etc.) in order to base all water bills on actual water consumption. By adopting smart water meters, in particular, it is possible to monitor water use remotely and in a timely manner and, for instance, to analyse the consumption patterns of different customers or identify weaknesses of the water distribution networks. Billing actual water consumption and enabling early identification of abnormal water usage (e.g. leakages) can result in significant water savings.

⁽¹⁶⁾ The EMAS Sectoral Reference Document for the waste management sector is currently under development. The intermediate results as well as the final document, once adopted, are available at: http://susproc.jrc.ec.europa.eu/activities/emas/waste_mgmt.html

Applicability

The technique is applicable to any existing water supply network.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i97) Penetration rate of water metering (% of consumers, % of water consumption covered by metering)	(b31) The penetration rate of water meters at household or final user level is 99 % or higher
(i98) Percentage of smart meters out of the total water meters in use (%)	(b32) In water-scarce areas ⁽¹⁾ (at least for part of the year), water meters at household/final user level are smart meters
(i99) Reduction in water use by final users after installation of water meters and/or smart meters (l/user)	(b33) All new buildings are equipped with water meters (smart meters in water-scarce areas)

⁽¹⁾ Water-scarce areas are those where there are insufficient water resources to satisfy long-term average requirements. More info available at: <http://ec.europa.eu/environment/water/quantity/about.htm>

3.9.2. Minimising water leakages from the water distribution system

It is BEMP to:

- carry out a detailed water balance of the water distribution system and manage water pressure, avoiding high levels,
- analyse the water distribution network and divide it into adequate district metering areas to detect water leakages by means of manual or automatic acoustic water leakage detectors,
- respond promptly and adequately to the identified faults and leakages of the network,
- establish a database to list and geo-reference all technical installations, the age of pipes, types of pipes, hydraulic data, previous interventions, etc.

Applicability

This BEMP is applicable to new and existing water distribution networks.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i100) Percentage of water loss out of the system input volume (%)	(b34) The Infrastructure Leakage Index is lower than 1,5
(i101) Infrastructure Leakage Index (ILI): calculated as current annual real losses (CARL)/unavoidable annual real losses (UARL) ⁽¹⁾	

⁽¹⁾ The current annual real losses (CARL) represent the amount of water that is actually lost from the distribution network (i.e. not delivered to final users). The unavoidable annual real losses (UARL) take into consideration that there will always be some leakage in a water distribution network. The UARL is calculated based on factors such as the length of the network, the number of service connections and the pressure at which the network is operating.

3.10. Best environmental management practices for waste water management

This section is targeted to public administrations responsible for waste water management and urban drainage.

3.10.1. Energy-efficient waste water treatment achieving full nitrifying conditions

It is BEMP to:

- have the installed capacity to treat at least twice the dry weather waste water flow (in case of rain or thawing),
- treat the waste water at nitrifying conditions (food to microorganisms ratio of $< 0,15 \text{ kg BOD}_5/\text{kg MLSS}^{(17)}$ per day), and perform denitrification and phosphorus removal,
- remove suspended solids by means of sand filtration (or by submerged membranes) in the case of sensitive receiving water bodies,
- implement other tertiary treatment to reduce micropollutants (see Section 3.10.2),
- continuous monitoring of organic compounds (total organic carbon), ammonia, nitrate and phosphorus in the case of plant capacities of more than 100 000 population equivalents (p.e.)⁽¹⁸⁾ or of a daily inflow BOD_5 load of more than 6 000 kg,
- stabilise primary and excess sludge in anaerobic digesters (see Section 3.10.3),
- dry the anaerobically stabilised sludge and send it to incineration (see Section 3.10.4),
- adopt energy-efficient technologies, such as energy-efficient fine bubble aeration systems in the biological stage and energy-efficient pumps and screw lifters.

Applicability

This technique is applicable to public administrations responsible for waste water management, both in new and existing waste water treatment plants.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i102) Concentrations in the discharged final effluent or removal efficiencies of COD, BOD_5 , ammonia, total nitrogen and total phosphorus (mg/l, %)	(b35) The removal efficiencies achieved are: at least 98 % for BOD_5 , at least 90 % for COD, at least 90 % for ammonia, at least 80 % for total organic nitrogen compounds, and at least 90 % for total phosphorus
(i103) Electricity use of the waste water treatment plant per mass of BOD_5 removed (kWh/kg of BOD_5 removed)	(b36) The electricity use of the waste water treatment plant is: — lower than 18 $\text{kWh/population equivalents/year}$ for large municipal waste water treatment plants (with a size of more than 10 000 population equivalents) — lower than 25 $\text{kWh/population equivalents/year}$ for small municipal waste water treatment plants (with a size of less than 10 000 population equivalents)
(i104) Electricity use of the waste water treatment plant per volume treated (kWh/m^3 of waste water treated)	
(i105) Annual electricity use of the waste water treatment plant per population equivalents ($\text{KWh/population equivalents/year}$)	

⁽¹⁷⁾ The following abbreviations are used in the text of the BEMP: BOD_5 : biochemical oxygen demand in 5 days; MLSS: mixed liquor suspended solids (biomass in the activated sludge system); COD: chemical oxygen demand.

⁽¹⁸⁾ 'Population equivalents', or p.e., term used in the Council Directive 91/271/EEC of 21 May 1991 concerning urban waste water treatment (OJ L 135, 30.5.1991, p. 40), covers the organic pollution generated by the residents of a city, town or village, and other sources such as non-resident population and agro-food industries.

3.10.2. Minimising waste water emissions with special consideration of micropollutants

It is BEMP to significantly remove micropollutants by implementing tertiary treatment, such as adsorption onto pulverised activated carbon (PAC) or oxidation with chlorine-free oxidising agents (specifically ozone).

Applicability

This BEMP is applicable to public administrations responsible for waste water management, both in new and existing municipal waste water treatment plants; however, for existing plants, there could be space constraints which can be overcome by adapted design of the equipment.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i106) Removal efficiency for micropollutants in the adsorption or ozonation stage in terms of COD or DOC ⁽¹⁾ (%)	(b37) The average removal efficiency for micropollutants is higher than 80 %
(i107) Percentage of the annual waste water flow undergoing tertiary treatment for micropollutants removal (%)	(b38) Micropollutants are removed from at least 90 % of the annual waste water flow

⁽¹⁾ DOC: dissolved organic carbon.

3.10.3. Anaerobic digestion of sludge and optimal energy recovery

It is BEMP to stabilise primary and excess sludge in anaerobic digesters and to employ the produced biogas, using efficient pumps and screw lifters, for on-site efficient electricity generation and for sludge drying.

Applicability

This BEMP is applicable to public administrations responsible for waste water management, in large new and existing waste water treatment plants, with a capacity of more than 100 000 population equivalents or of a daily inflow BOD₅ load of more than 6 000 kg.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i108) Percentage of electricity and heat needs of the waste water treatment plant met by own-generated electricity and heat from biogas on an annual basis (%)	(b39) Own-generated electricity and heat from biogas cover 100 % of the energy use for municipal waste water treatment plants with a size of more than 100 000 population equivalents without on-site thermal sludge drying, and 50 % in the case of plants with on-site thermal sludge drying
(i109) Electrical efficiency of the generator fuelled with biogas (%)	
(i110) Specific biogas production (Nl ⁽¹⁾ /kg organic dry matter input)	

⁽¹⁾ Nl: normal litre, i.e. volume of gas measured at standard conditions (pressure: 1,01325 bar; temperature: 0 °C)

3.10.4. Drying and incineration of sludge

It is BEMP to efficiently mechanically dewater the anaerobically stabilised sludge, e.g. by means of chamber filter presses, and then completely oxidise it in a mono-incineration plant (as detailed in the best available techniques reference documents⁽¹⁹⁾ according to the Industrial Emissions Directive⁽²⁰⁾). The phosphorus contained in the ash of the incineration residue can be recovered.

Applicability

The technique is applicable to public administrations responsible for waste water management, both in new and existing waste water treatment plants. In the case of small plants, the mechanically dewatered sludge can be sent to a separate central mono-incineration sludge plant instead of being incinerated on site.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i111) Percentage of the sewage sludge produced in the waste water treatment plant that is mono-incinerated (%)	—
(i112) Percentage of phosphorus present in the incineration ashes of the waste water treatment plant that is recovered (%)	

3.10.5. Promoting the use of reclaimed water from waste water treatment effluents

It is BEMP to promote the use of reclaimed water from waste water treatment effluents. This can be used for, e.g.:

- irrigation, including non-agricultural irrigation, e.g. parks,
- non-potable urban uses, such as street cleaning, snowmaking for adjacent ski resorts, toilet flushing in public buildings, public fountains,
- industrial uses, e.g. cooling,
- groundwater recharging.

Local public administrations can ensure the possibility to use the reclaimed water in some specific applications by fitting waste water treatment plants with the appropriate tertiary and disinfection treatment systems as needed. In the process, local public administrations need to engage with relevant stakeholders (e.g. local farmers, agricultural cooperatives) that may be interested in making use of the reclaimed water.

Applicability

This BEMP is applicable to all public administrations in charge of waste water treatment. However, water reuse is particularly relevant in water-scarce areas, where it can reduce the impact on water resources and where the extra investments and operational costs are economically feasible.

⁽¹⁹⁾ The Best Available Techniques (BAT) Reference Documents (BREFs) according to the Industrial Emissions Directive are available at: <http://eippcb.jrc.ec.europa.eu/reference/>

⁽²⁰⁾ Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (OJ L 334, 17.12.2010, p. 17).

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i113) Amount of reclaimed water produced from waste water treatment in a given time period (m ³ /year, m ³ /hour)	—
(i114) Percentage of reclaimed water out of the total waste water treated (%)	

3.10.6. Retention and treatment of overflows from combined sewer systems and of storm water from separate sewer systems

In the case of combined sewers ⁽²¹⁾, it is BEMP to treat the overflow of the retention tanks, by means of fine screens (4-6 mm) and sediment tanks, and, depending on the water quality of the received water, by soil retention filters or other techniques with a similar suspended solids, COD, heavy metals and organic pollutants removal efficiency.

In the case of separate sewers, it is BEMP to treat the storm water depending on its level of pollution, and directly discharge only storm water with no or low pollution.

Applicability

This BEMP is applicable to all local authorities responsible for waste water management and urban drainage.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i115) For combined sewer systems, ratio of pollutants (total suspended solids, COD and heavy metals) discharged to water bodies from waste water treatment out of the total emissions (from treated waste water plus storm water overflows) (%)	—
(i116) For separate sewer systems, percentage of contaminated impervious areas from which storm water is adequately treated (%)	

3.10.7. Sustainable urban drainage system

It is BEMP to reduce the flow of storm water reaching combined and separate sewers by improving water infiltration into soil (e.g. reducing soil sealing). This allows the limiting of overflows to situations of very heavy rainfall and ensuring that all discharges of urban run-off are well managed in order to avoid relevant emissions of pollutants to the receiving water body. Local authorities can promote sustainable urban drainage by including appropriate provisions, based on a holistic approach at the river basin level, in the local policies for land use (see also Section 3.4.3).

⁽²¹⁾ In combined sewer systems, waste water and storm water (from storm or rain events) are collected in the same sewer network. In separate sewer systems, waste water and storm water are collected and sent for treatment or discharge via separate sewer networks.

Applicability

This BEMP is applicable to all local authorities responsible for urban drainage and land use planning. The sustainable urban drainage measures can be implemented in new and existing developments. However, in existing built areas there may be some constraints (e.g. lack of space available for local infiltration).

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i76) Percentage of artificial surfaces (i.e. any kind of impermeable built area: buildings, roads, any part with no vegetation or water) in the territory of the municipality (km ² of artificial surface/km ² of total surface)	—
(i117) Annual percentage of estimated rainwater which is retained and infiltrated into the ground locally out of the total estimated rainwater falling on the urban area of the municipality (%)	

3.11. Best environmental management practices for green public procurement

This section is targeted to all public administrations.

3.11.1. Systematically including environmental criteria in all public procurement

It is BEMP to introduce environmental criteria for the procurement of products (goods, services and works) and to consider most economical, in the tender criteria, the life-cycle cost of a product or service and not only the initial investment for its purchase.

Environmental criteria can be introduced in the technical specifications, selection criteria, award criteria and contract performance clauses of any tender where a relevant potential environmental impact is expected.

Public administrations needing guidance on the formulation of the environmental criteria can:

- introduce the EU Green Public Procurement⁽²²⁾ (EU GPP) comprehensive criteria, when available for the specific product, in the technical specifications, selection criteria, award criteria and contract performance clauses,
- where no EU GPP recommendations exist, refer to the EU Ecolabel, when available for the specific product by using the EU Ecolabel criteria in public procurement⁽²³⁾,
- introduce as an award criterion in public tenders for the procurement of goods, services and works the EMAS registration of the suppliers, providing additional points in the evaluation process of the bids provided that the implementation of an environmental management system is relevant with regards to the substance matter of the contract. In sectors or areas where there is a low number of EMAS registered organisations among the market players and this could restrict the number of bids, reference can be extended to environmental management systems based on international standard (i.e. ISO 14001). However public administrations can reward the higher credibility and reliability of EMAS by providing more point to EMAS registered organisations than to organisations with other environmental management systems that do not present the same guarantees.

⁽²²⁾ For information on the EU Green Public Procurement criteria and the complete list of products covered, please see: http://ec.europa.eu/environment/gpp/index_en.htm.

⁽²³⁾ In order to not restrict the number of tenders, in the technical specifications reference can be made to the criteria of the EU Ecolabel for that specific product or service group; for verification, a valid licence of the EU Ecolabel can be required. According to Art. 44(2) of Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC (OJ L 94, 28.3.2014, p. 65), contracting authorities must also accept other appropriate means of proof.

Applicability

This BEMP is applicable to all public administrations.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i118) Percentage of tenders including environmental criteria out of the total number of tenders, disaggregated by product category (%)	(b40) 100 % of tenders include environmental criteria that require at least the level of performance set in the EU GPP criteria, for products where EU GPP criteria are available (e.g. office paper, cleaning agents, furniture)

3.12. Best environmental management practices for environmental education and dissemination of information

This section is targeted to public administrations responsible for the environmental education of citizens and provision of environmental information to businesses.

3.12.1. Environmental education and information for citizens and businesses

It is BEMP to provide environmental education and information to citizens and businesses with the objective of:

- fostering public awareness of environmental problems,
- providing practical information on the everyday contribution that citizens and businesses can make to environmental protection and efficient utilisation of resources,
- creating new patterns of behaviour among different groups within society,
- inspiring citizens to get to know and appreciate the local environment and reconnect with nature,
- stimulating an understanding of the environmental interdependence between urban and surrounding rural and natural areas.

Such objectives can be achieved by organising educational seminars, conferences, workshops for the general public or specific groups of citizens, businesses or professionals on specific subjects (e.g. energy-efficient buildings). Moreover, the local public administration can provide specific information on legal (and other) environment-related aspects and on incentives available (e.g. incentives for energy efficiency). All the activities can be organised with the involvement and cooperation of residents, local organisations and businesses that support the environmental education and information of citizens.

Applicability

This BEMP is applicable to all public administrations with a role in informing the public on environmental matters.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i119) Percentage of citizens reached directly and indirectly by the environmental education actions	—
(i120) Presence of a municipal service or agency for provision of environment-related information to businesses (y/n)	

4. RECOMMENDED SECTOR-SPECIFIC KEY ENVIRONMENTAL PERFORMANCE INDICATORS

The following table lists a **selection of key environmental performance indicators** for the public administration sector. These are a subset of all the indicators mentioned in Chapter 3. The table is divided according to the structure of this document.

Indicator	Common unit	Main target group	Short description	Recommended minimum level of monitoring	Related core indicator in accordance with Annex IV to Regulation (EC) No 1221/2009 (Section C.2)	Benchmark of excellence	Related best environmental management practice
BEMPs FOR SUSTAINABLE OFFICES							
1. Total annual energy use	kWh/m ² /year kWh/FTE/year	Public administrations owning or managing offices	Total annual energy use divided by the total internal floor area or the number of full time equivalent (FTE) employees. The indicator can also be broken down into: — space heating, — space cooling, — lighting, — other electricity uses.	Building level	Energy efficiency	—	BEMP 3.1.1
2. Total annual greenhouse gas emissions	kg CO ₂ eq/m ² /year kg CO ₂ eq/FTE/year	Public administrations owning or managing offices	Total annual greenhouse gas emissions generated from the use of office buildings divided by the total internal floor area or the number of full time equivalent (FTE) employees	Building level	Energy efficiency	—	BEMP 3.1.1
3. Total annual water use	m ³ /FTE/year m ³ /m ² /year	Public administrations owning or managing offices	Total annual water consumption in office buildings, divided by the total internal floor area or the number of full time equivalent (FTE) employees, broken down into (if relevant): — mains water use, — harvested rainwater use, — recycled greywater use.	Building level	Water	Water use in office buildings is lower than 6,4 m ³ /full time equivalent employee/year	BEMP 3.1.2

Indicator	Common unit	Main target group	Short description	Recommended minimum level of monitoring	Related core indicator in accordance with Annex IV to Regulation (EC) No 1221/2009 (Section C.2)	Benchmark of excellence	Related best environmental management practice
4. Total annual office waste generation	kg/FTE/year	Public administrations owning or managing offices	Total annual office waste generation in office buildings divided by the number of full time equivalent (FTE) employees	Building level	Waste	Total waste generation in office buildings is lower than 200 kg/full time equivalent employee/year	BEMP 3.1.3
5. Total annual office waste recycled	%	Public administrations owning or managing offices	Percentage by weight of the total waste generated in offices which is separately collected for recycling	Building level	Waste	Zero waste generated in the office buildings is sent to landfill	BEMP 3.1.3
6. Daily quantity of office paper used per full time equivalent employee	sheets of paper/FTE/working day	Public administrations owning or managing offices	Total number of sheets of office paper used annually divided by the number of full time equivalent (FTE) employees and the number of working days	Organisation level	Material efficiency	Office paper consumption is lower than 15 A4 sheets/full time equivalent employee/working day	BEMP 3.1.4
7. Share of environmentally friendly certified office paper purchased	%	Public administrations owning or managing offices	Percentage of environmentally friendly certified office paper purchased (number of reams) out of the total purchased office paper (number of reams)	Organisation level	Energy efficiency Material efficiency Water Waste Biodiversity Emissions	Office paper used is 100 % recycled or certified according to an ISO Type I ecolabel (e.g. EU Ecolabel).	BEMP 3.1.4

Indicator	Common unit	Main target group	Short description	Recommended minimum level of monitoring	Related core indicator in accordance with Annex IV to Regulation (EC) No 1221/2009 (Section C.2)	Benchmark of excellence	Related best environmental management practice
8. Adoption of tools for promoting sustainable commuting for employees	y/n	Public administrations owning or managing offices	Staff are engaged about sustainable commuting thanks to the implementation and promotion of tools driving behaviour change	Organisation level	Emissions	Tools for promoting sustainable commuting for employees are implemented and promoted	BEMP 3.1.5
9. Implementation of carbon budgeting for business travel	y/n	Public administrations owning or managing offices	A total carbon budget for business trips is allocated over a defined period. For each trip, the corresponding carbon emission equivalent is subtracted from the remaining carbon budget.	Organisation level	Emissions	Carbon budgeting is implemented for all business travel	BEMP 3.1.5
10. Availability and monitoring of video-conferencing facilities	y/n	Public administrations owning or managing offices	Videoconferencing facilities are promoted within the organisation and the number of hours of use is monitored. All staff can use the videoconferencing facilities.	Organisation level	Emissions	Videoconferencing facilities are available to all staff and their use is monitored and promoted	BEMP 3.1.5
11. Food waste generated	g/meal	Public administrations owning or managing canteens and coffee bars	Amount of food waste generated per meal served in canteens and coffee bars	Organisation level	Waste	—	BEMP 3.1.6

Indicator	Common unit	Main target group	Short description	Recommended minimum level of monitoring	Related core indicator in accordance with Annex IV to Regulation (EC) No 1221/2009 (Section C.2)	Benchmark of excellence	Related best environmental management practice
BEMPs FOR SUSTAINABLE ENERGY AND CLIMATE CHANGE							
12. Carbon emissions of the territory of the municipality	kg CO ₂ eq/inhabitant	All local authorities	Total annual carbon emissions (as tonnes of CO ₂ eq) of the municipality (including housing, industries, agriculture, commerce/services such as construction) divided by the number of inhabitants of the territory	Territory administered	Emissions	—	BEMPs 3.2.1, 3.2.2
13. Existence of a municipal energy and climate action plan	y/n	All local authorities	The municipal energy and climate action plan, with long— and short-term targets and actions, is based on the inventory of energy use and emissions of the territory	Territory administered	Emissions	A municipal energy and climate action plan, including targets and actions and based on the inventory of energy use and emissions, is in place	BEMP 3.2.2
14. Adoption of a strategy for climate change adaptation	y/n	All local authorities	A holistic climate change adaptation strategy within the territory of the municipality can build on other local and regional adaptation strategies	Territory administered	—	A holistic climate change adaptation strategy for the territory of the municipality is in place	BEMP 3.2.3
15. Energy use for street lighting	kWh/inhabitant/year MWh/km/year	Public administrations managing directly or indirectly street lighting	Annual energy use for street lighting calculated per inhabitant or per km of street lit	Territory administered	Energy efficiency	Street lighting energy use per kilometre is lower than 6 MWh/km/year	BEMP 3.2.4

Indicator	Common unit	Main target group	Short description	Recommended minimum level of monitoring	Related core indicator in accordance with Annex IV to Regulation (EC) No 1221/2009 (Section C.2)	Benchmark of excellence	Related best environmental management practice
16. Total annual energy use in public buildings	kWh/m ² /year	Public administrations owning or managing buildings	Total annual energy use in the public building considered (taking into account space heating, space cooling and electricity), expressed as final energy use, divided by the floor area of the building	Building level	Energy efficiency	For newbuilds, the building is designed with a total primary energy use (including all uses) lower than 60 kWh/m ² /year For existing buildings undergoing renovation, the building is designed with a total primary energy use (including all uses) lower than 100 kWh/m ² /year	BEMPs 3.2.5, 3.2.6, 3.2.7, 3.2.8
17. Training provided to staff on energy efficiency	hours/FTE/year	Public administration owning or managing buildings	Annual number of hours of environment-specific staff training in order to improve energy efficiency in buildings. The annual number of hours of training is divided by the total number of full time equivalent (FTE) employees	Building level	Energy efficiency	—	BEMP 3.2.8
18. CO ₂ emissions from district heating/cooling	t CO ₂ eq kg CO ₂ eq/m ²	All local authorities	Amount of CO ₂ eq emissions of the heating and cooling system before and after the installation of a district heating/cooling network, in total or per unit of floor area of the buildings heated or cooled	District heating/cooling network	Emissions	—	BEMP 3.2.9

Indicator	Common unit	Main target group	Short description	Recommended minimum level of monitoring	Related core indicator in accordance with Annex IV to Regulation (EC) No 1221/2009 (Section C.2)	Benchmark of excellence	Related best environmental management practice
19. Share of the energy use met by renewable energy sources	%	Public administration owning or managing buildings	Renewable energy (electricity and heat separately) produced on site/nearby, divided by the energy use (electricity and heat separately) of the public buildings or social housing	Building level	Energy efficiency Emissions	100 % of the electricity used in a public building is met by on-site generation of renewable electricity 100 % of the hot water demand in a public building/social housing building is met by on-site renewable heat generation	BEMP 3.2.10
20. Local planning system in place, imposing higher energy standards and renewable energy generation requirements	y/n	Local authorities setting the local building code and/or providing building permits	The local planning system includes the provision that new builds and renovations within the territory are carried out to exemplary energy standards and have a minimum renewable energy generation requirement	Territory administered	Energy efficiency Emissions	—	BEMP 3.2.11
21. Delivery of information and advice services	y/n	Public administrations promoting energy efficiency and renewable energy for residents and businesses	The public administration delivers information and advice services on energy efficiency and renewable energy to residents and businesses to reduce their energy consumption	Territory administered	Energy efficiency Emissions	—	BEMP 3.2.13

Indicator	Common unit	Main target group	Short description	Recommended minimum level of monitoring	Related core indicator in accordance with Annex IV to Regulation (EC) No 1221/2009 (Section C.2)	Benchmark of excellence	Related best environmental management practice
22. Share of the territory covered with thermography	%	All local authorities	Area of the urban territory of the municipality which has been covered by thermographic surveying divided by the total urban area of the municipality	Territory administered	Energy efficiency Emissions	Recent (< 5 years) high-resolution (< 50 cm) thermographic data is available for 100 % of the built area in the territory of the municipality	BEMP 3.2.14

BEMPs FOR MOBILITY

23. Modal share of journeys	%	Public administrations responsible for mobility	Number of journeys, in the territory considered, carried out by different means of transport (e.g. car, bus, bike), divided by the total number of journeys	Territory administered	Emissions	The city has a modal split for cycling of 20 % or higher OR the city has increased its modal split for cycling by at least 50 % during the last five years. The share of sustainable modes of transport used in the city (e.g. walking, cycling, bus, tram, train) is 60 % or higher	BEMP 3.3.1, 3.3.2, 3.3.6, 3.3.7, 3.3.8
24. A dedicated policy for walking/cycling is in place	y/n	Public administrations responsible for mobility	The city has a dedicated policy that is politically adopted and fosters walking/cycling: additionally, goals for improvement and investments in walking/cycling infrastructure are defined	Territory administered	Emissions	At least 10 % of the city's investment in transport infrastructure and maintenance is dedicated to cycling infrastructure	BEMP 3.3.2
25. Total length of cycling infrastructure	km km of cycle lanes/km of roads	Public administrations responsible for mobility	The length of cycling infrastructure (cycling lanes) can be measured in absolute terms (km) or divided by the length of road networks for vehicles	Territory administered	Emissions	—	BEMP 3.3.2

Indicator	Common unit	Main target group	Short description	Recommended minimum level of monitoring	Related core indicator in accordance with Annex IV to Regulation (EC) No 1221/2009 (Section C.2)	Benchmark of excellence	Related best environmental management practice
26. Number of car-sharing users	Number of users/ 10 000 inhabitants Number of users/ number of car-share vehicles	Public administrations responsible for mobility	The number of car-sharing users can be calculated as: — the total number of car-sharing users divided by the number of inhabitants, multiplied by 10 000 — the total number of car-sharing users divided by the number of car-share vehicles	Territory administered	Emissions	—	BEMP 3.3.3.
27. Shared cars available	Number of inhabitants/number of shared cars	Public administrations responsible for mobility	The number of inhabitants in the territory of the municipality is divided by the number of cars available in the fleet of the car-sharing scheme	Territory administered	Emissions	At least 1 shared car available per 2 500 inhabitants	BEMP 3.3.3
28. Privately owned cars replaced	Number of privately owned cars replaced/ number of car-sharing vehicles	Public administrations responsible for mobility	The number of privately owned cars which have been replaced by the car-sharing scheme (owners not needing them any more) divided by the total number of cars available in the fleet of the car-sharing scheme	Territory administered	Emissions	At least 8 privately owned cars have been replaced by each vehicle in the car-sharing operator's fleet	BEMP 3.3.3
29. Share of trips paid for by integrated ticketing	%	Public administrations responsible for public transport	Number of trips carried out by public transport using multiple modes of transport and paid for by integrated ticketing divided by the total number of trips carried out by public transport using multiple modes of transport	Territory administered	Emissions	At least 75 % of trips are paid for by the integrated ticket	BEMP 3.3.4

Indicator	Common unit	Main target group	Short description	Recommended minimum level of monitoring	Related core indicator in accordance with Annex IV to Regulation (EC) No 1221/2009 (Section C.2)	Benchmark of excellence	Related best environmental management practice
30. Share of electric vehicles	%	All local authorities	The total number of electric vehicles (per type, e.g. e-cars, e-bikes) on the road divided by the total number of vehicles of that type	Territory administered	Emissions	—	BEMP 3.3.5
31. Number of charging points	Number of charging points/inhabitant	All local authorities	The total number of public charging points for electric vehicles divided by the number of inhabitants of the territory considered	Territory administered	Emissions	—	BEMP 3.3.5
32. Reduction in the concentration of air pollutants	%	All local authorities	The concentration of air pollutants (PM₁₀, ammonia and nitrogen oxide) is measured regularly in certain areas of the city (e.g. close to schools, parks, residential areas). The reduction in the concentration of air pollutants is calculated as the initial concentration of each air pollutant (before the introduction of the congestion charge) minus the final concentration (after the introduction of the congestion charge) of the air pollutant divided by the initial concentration of air pollutant	Territory administered	Emissions	The concentration of air pollutants (PM ₁₀ , ammonia and nitrogen oxide) is reduced by 10 % (on average) within the congestion charge area, compared to the situation before the introduction of the congestion charge	BEMP 3.3.7
33. Reduction in vehicular access to the congestion charge area	%	All local authorities	Number of private vehicles accessing the congestion charge area divided by the number of private vehicles accessing the same area before the introduction of the congestion charge	Congestion charge area	Emissions	Vehicular access of non-exempt vehicles to the congestion charge area is reduced by 20 % compared to the situation before the introduction of the congestion charge	BEMP 3.3.7

Indicator	Common unit	Main target group	Short description	Recommended minimum level of monitoring	Related core indicator in accordance with Annex IV to Regulation (EC) No 1221/2009 (Section C.2)	Benchmark of excellence	Related best environmental management practice
34. Increased speed and punctuality of public transport	%	All local authorities	Average speed of public transport after the implementation of a congestion charge divided by the average speed of public transport before the introduction of the congestion charge. The same can be applied to the punctuality of public transport before and after the introduction of a congestion charge	Congestion charge area	Emissions	The speed and punctuality of public transport services are improved by 5 % compared to the situation before the introduction of the congestion charge	BEMP 3.3.7
35. Share of available parking spaces during business hours	%	All local authorities	Average number of available parking spaces during business hours divided by the total number of parking spaces	Territory administered	Emissions	On-street parking spaces are between 80 % and 90 % occupied during 90 % of business hours	BEMP 3.3.8
36. Minimum parking requirements	y/n	All local authorities	The public administration can limit free parking spaces (for on-street parking and underground garages) for new developments and can have a formal policy to incrementally remove any previous parking requirements from existing developments	Territory administered	Emissions Biodiversity	The city has no minimum parking requirements (for on-street parking and underground garages) for new developments and has a formal policy to incrementally remove any previous parking requirements from existing developments	BEMP 3.3.8
37. CO ₂ emissions from delivery vehicles	kg CO ₂ /year kg CO ₂ /month	Public administrations responsible for mobility	Total CO ₂ emissions from delivery vehicles over a specific timespan (e.g. yearly, monthly) in the area served by the logistics service centre	Area served by the logistics service centre	Emissions	40 % reduction in CO ₂ emissions from delivery vehicles in the service area compared to the situation before the implementation of the logistics service centre	BEMP 3.3.9

Indicator	Common unit	Main target group	Short description	Recommended minimum level of monitoring	Related core indicator in accordance with Annex IV to Regulation (EC) No 1221/2009 (Section C.2)	Benchmark of excellence	Related best environmental management practice
38. Daily number of delivery trips in the service area	Number of deliveries/day	Public administrations responsible for mobility	Number of delivery trips per day by delivery vehicles in the area served by the logistics service centre	Area served by the logistics service centre	Emissions	75 % reduction in the number of delivery trips per day to the service area compared to the situation before the implementation of the logistics service centre	BEMP 3.3.9

BEMP FOR LAND USE

39. Share of new built areas	%	All local authorities responsible for land use planning	Area of new built area (m ²), considering any kind of impermeable built area (buildings, roads, any part with no vegetation or water) divided by the built area at the beginning of the period considered (e.g. 1, 5, 10 years)	Territory administered	Biodiversity	—	BEMP 3.4.1
40. Measures to mitigate the urban heat island effect are promoted	y/n	All local authorities responsible for land use planning	Measures to mitigate the urban heat island effect (such as green areas, green roofs or use of reflective materials) are promoted in the territory administered both in private and public buildings and areas	Territory administered	Emissions Energy efficiency Biodiversity	—	BEMP 3.4.2
41. Low-impact drainage measures are required	y/n	All local authorities responsible for land use planning	There is a requirement for low-impact drainage measures for the construction of new developments, including major redevelopments of existing built areas	Territory administered	Biodiversity	—	BEMP 3.4.3

Indicator	Common unit	Main target group	Short description	Recommended minimum level of monitoring	Related core indicator in accordance with Annex IV to Regulation (EC) No 1221/2009 (Section C.2)	Benchmark of excellence	Related best environmental management practice
BEMPs for Green Urban Areas							
42. Share of natural and semi-natural areas	%	Public administrations responsible for the management of green urban areas	Area (km ²) of natural and semi-natural environments in the urban area divided by the total urban area	Territory administered	Biodiversity	—	BEMP 3.5.1
43. Share of green and blue urban areas	%	Public administrations responsible for the management of green urban areas	Area (km ²) of green and blue urban areas (in the urban area) divided by the total urban area	Territory administered	Biodiversity	—	BEMP 3.5.2
44. Share of green roofs	%	All local authorities responsible for land use planning	Number of buildings with green roofs divided by the total number of buildings in the territory of the municipality	Territory administered	Biodiversity	—	BEMP 3.5.3
45. Plan regarding derelict green areas and fringe areas	y/n	All local authorities responsible for land use planning	The public administration has a plan regarding the restoration and environmental management of the derelict green areas and fringe areas within the urban area	Territory administered	Biodiversity	—	BEMP 3.5.4

Indicator	Common unit	Main target group	Short description	Recommended minimum level of monitoring	Related core indicator in accordance with Annex IV to Regulation (EC) No 1221/2009 (Section C.2)	Benchmark of excellence	Related best environmental management practice
BEMP FOR LOCAL AMBIENT AIR QUALITY							
46. Concentration of air pollutants	µg/m ³	All public administrations responsible for the management of air quality	Level of air pollutants (PM ₁₀ , PM _{2.5} , NO ₂) present (annual average) in the urban area sampled in certain locations (e.g. school, parks, residential areas)	Territory administered	Emissions	For all the indicators defined in this BEMP, the results achieve the levels set in the air quality guidelines produced by the World Health Organisation	3.6.1
BEMP FOR NOISE POLLUTION							
47. Share of noise measurement levels exceeding local limit values	%	Public administrations responsible for tackling noise pollution	Number of measurements of noise levels exceeding the local limit values divided by the total number of noise level measurements	Territory administered	—	—	BEMP 3.7.1
BEMPs FOR WATER SUPPLY							
48. Penetration rate of water metering	%	Public administrations responsible for potable water supply	Number of consumers with single meters (at single user level) divided by the total number of consumers	Territory administered	Water	The penetration rate of water meters at household or final user level is 99 % or higher	BEMP 3.9.1
49. Share of smart water meters	%	Public administrations responsible for potable water supply	Number of consumers with smart water meters divided by the total number of consumers with water meters	Territory administered	Water	In water-scarce areas (at least for part of the year), water meters at household/final user level are smart meters All new buildings are equipped with water meters (smart meters in water-scarce areas)	BEMP 3.9.1

Indicator	Common unit	Main target group	Short description	Recommended minimum level of monitoring	Related core indicator in accordance with Annex IV to Regulation (EC) No 1221/2009 (Section C.2)	Benchmark of excellence	Related best environmental management practice
50. Water Infrastructure Leakage Index (ILI)	%	Public administrations responsible for potable water supply	The ILI is calculated as current annual real losses (CARTL)/unavoidable annual real losses (UARL)	Territory administered	Water	The Infrastructure Leakage Index is lower than 1,5	BEMP 3.9.2

BEMPs FOR WASTE WATER MANAGEMENT

51. Removal efficiency for water pollutants	%	Public administrations responsible for waste water management	The removal efficiency for each water pollutant (COD, BOD ₅ , ammonia, total nitrogen and total phosphorus) is calculated as the initial concentration for each water pollutant minus the final concentration of water pollutant divided by the initial concentration of water pollutant	Waste water treatment plant	Water	The removal efficiencies achieved are: at least 98 % for BOD ₅ , at least 90 % for COD, at least 90 % for ammonia, at least 80 % for total organic nitrogen compounds, and at least 90 % for total phosphorus	BEMP 3.10.1
52. Electricity use of waste water treatment	kWh/population equivalents/year	Public administrations responsible for waste water management	The total annual electricity use of waste water treatment divided by the number of population equivalents the waste water treatment plant is designed/operates for	Waste water treatment plant	Water	The electricity use of the waste water treatment plant is: — lower than 18 kWh/population equivalents/year for large municipal waste water treatment plants (with a size of more than 10 000 population equivalents) — lower than 25 kWh/population equivalents/year for small municipal waste water treatment plants (with a size of less than 10 000 population equivalents)	BEMP 3.10.1
53. Removal efficiency for micropollutants	%	Public administrations responsible for waste water management	The removal efficiency is calculated as the initial concentration of micropollutants minus the final concentration of micropollutants divided by the initial concentration of micropollutant	Waste water treatment plant	Water	The average removal efficiency for micropollutants is higher than 80 %	BEMP 3.10.2

Indicator	Common unit	Main target group	Short description	Recommended minimum level of monitoring	Related core indicator in accordance with Annex IV to Regulation (EC) No 1221/2009 (Section C.2)	Benchmark of excellence	Related best environmental management practice
54. Share of waste water flow undergoing tertiary treatment for micropollutants removal	%	Public administrations responsible for waste water management	Annual waste water flow which undergoes tertiary treatment for micropollutants removal divided by the total annual waste water flow	Waste water treatment plant	Water	Micropollutants are removed from at least 90 % of the annual waste water flow	BEMP 3.10.2
55. Share of own-generated electricity and heat in the waste water treatment plant	%	Public administrations responsible for waste water management	Energy generated (electricity and heat from biogas) on site from anaerobic digestion of sludge and used in the waste water treatment plant divided by the total amount of energy used in the waste water treatment plant	Waste water treatment plant	Water	Own-generated electricity and heat from biogas cover 100 % of the energy use for municipal waste water treatment plants with a size of more than 10 000 population equivalents without on-site thermal sludge drying, and 50 % in the case of plants with on-site thermal sludge drying	BEMP 3.10.3
56. Share of mono-incinerated sewage sludge	%	Public administrations responsible for waste water management	Sewage sludge produced in waste water treatment that is mono-incinerated divided by the total amount of sewage sludge generated from waste water treatment	Waste water treatment plant	Water	—	BEMP 3.10.4
57. Share of reclaimed water	%	Public administrations responsible for waste water management	Amount of reclaimed water produced from waste water treatment divided by the total amount of waste water treated	Territory administered	Water	—	BEMP 3.10.5

Indicator	Common unit	Main target group	Short description	Recommended minimum level of monitoring	Related core indicator in accordance with Annex IV to Regulation (EC) No 1221/2009 (Section C.2)	Benchmark of excellence	Related best environmental management practice
BEMP FOR GREEN PUBLIC PROCUREMENT							
58. Share of rainwater retained and infiltrated in urban areas	%	Public administrations responsible for urban drainage and land use planning	Annual percentage of estimated rainwater which is retained and infiltrated into the ground locally out of the total estimated rainwater falling on the urban area of the municipality	Territory administered	Water	—	BEMP 3.10.7
59. Share of tenders with environmental criteria	%	All public administrations	Number of tenders including environmental criteria divided by the total number of tenders (disaggregated by product category)	Organisation level	Energy efficiency Material efficiency Water Waste Biodiversity Emissions	100 % of tenders include environmental criteria that require at least the level of performance set in the EU GPP criteria, for products where EU GPP criteria are available (e.g. office paper, cleaning agents, furniture)	BEMP 3.11.1
BEMP FOR ENVIRONMENTAL EDUCATION AND DISSEMINATION OF INFORMATION							
60. Share of citizens reached directly and indirectly by the environmental education actions	%	Public administrations	Share of citizens reached directly and indirectly by the environmental education actions	Territory administered	Energy efficiency Material efficiency Water Waste Biodiversity Emissions	—	BEMP 3.12.1

COMMISSION DECISION (EU) 2019/62

of 19 December 2018

on the sectoral reference document on best environmental management practices, sector environmental performance indicators and benchmarks of excellence for the car manufacturing sector under Regulation (EC) No 1221/2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS)

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC ⁽¹⁾, and in particular Article 46 (1) thereof,

Whereas:

- (1) Regulation (EC) No 1221/2009 obliges the Commission to develop sectoral reference documents for specific economic sectors. The documents must include best environmental management practices, environmental performance indicators and, where appropriate, benchmarks of excellence and rating systems identifying environmental performance levels. Organisations registered or preparing to become registered under the eco-management and audit scheme established by Regulation (EC) No 1221/2009 are required to take those documents into account when developing their environmental management system and when assessing their environmental performance in their environmental statement, or updated environmental statement, prepared in accordance with Annex IV to that Regulation.
- (2) Regulation (EC) No 1221/2009 required the Commission to establish a working plan setting out an indicative list of sectors to be considered priority sectors for the adoption of sectoral and cross-sectoral reference documents. 'Communication from the Commission — Establishment of the working plan setting out an indicative list of sectors for the adoption of sectoral and cross-sectoral reference documents, under Regulation (EC) No 1221/2009 on the voluntary participation of organisations in a Community eco-management and audit scheme (EMAS)' ⁽²⁾ identified the car manufacturing sector as a priority sector.
- (3) The sectoral reference document for the car manufacturing sector should focus on best practices, indicators and benchmarks for car manufacturers, including manufacturers of parts and components, and end-of-life vehicle treatment facilities. It should make reference to existing guidance for aspects covered by other Union policy tools, such as Directive 2000/53/EC of the European Parliament and of the Council ⁽³⁾ or the Best Available Techniques (BAT) reference documents developed under Directive 2010/75/EU of the European Parliament and of the Council ⁽⁴⁾. For the rest, it should identify, by way of best environmental management practices for the sector, concrete actions to improve the overall environmental management of companies in the sector, including direct aspects related e.g. to the manufacturing process, and indirect aspects including e.g. the supply chain management, with a view to fostering a more circular economy.
- (4) In order to allow organisations, environmental verifiers and others sufficient time to prepare for introduction of the sectoral reference document for the car manufacturing sector, the date of application of this Decision should be deferred by a period of 120 days from the date of its publication in the *Official Journal of the European Union*.
- (5) In developing the sectoral reference document annexed to this Decision, the Commission has consulted with Member States and other stakeholders in accordance with Regulation (EC) No 1221/2009.

⁽¹⁾ OJ L 342, 22.12.2009, p. 1.

⁽²⁾ OJ C 358, 8.12.2011, p. 2.

⁽³⁾ Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles (OJ L 269, 21.10.2000, p. 34).

⁽⁴⁾ Directive 2010/75/EU of the European Parliament and of the Council of 24 November 2010 on industrial emissions (integrated pollution prevention and control) (OJ L 334, 17.12.2010, p. 17).

- (6) The measures provided for in this Decision are in accordance with the opinion of the Committee established by Article 49 of Regulation (EC) No 1221/2009,

HAS ADOPTED THIS DECISION:

Article 1

The sectoral reference document on best environmental management practices, sector environmental performance indicators and benchmarks of excellence for the car manufacturing sector for the purposes of Regulation (EC) No 1221/2009 is set out in the Annex to this Decision.

Article 2

This Decision shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

It shall apply from 18 May 2019.

Done at Brussels, 19 December 2018.

For the Commission

The President

Jean-Claude JUNCKER

ANNEX

1. INTRODUCTION

This Sectoral Reference Document (SRD) for the car manufacturing sector is based on a detailed scientific and policy report ⁽¹⁾ ('Best Practice Report') developed by the European Commission's Joint Research Centre (JRC).

Relevant legal background

The Community eco-management and audit scheme (EMAS) was introduced in 1993, for voluntary participation by organisations, by Council Regulation (EEC) No 1836/93 ⁽²⁾. Subsequently, EMAS has undergone two major revisions:

- Regulation (EC) No 761/2001 of the European Parliament and of the Council ⁽³⁾;
- Regulation (EC) No 1221/2009.

An important new element of the latest revision, which came into force on 11 January 2010, is Article 46 on the development of SRDs. The SRDs have to include best environmental management practices (BEMPs), environmental performance indicators for the specific sectors and, where appropriate, benchmarks of excellence and rating systems identifying performance levels.

How to understand and use this document

The eco-management and audit scheme (EMAS) is a scheme for voluntary participation by organisations committed to continuous environmental improvement. Within this framework, this SRD provides sector-specific guidance to the car manufacturing sector and points out a number of options for improvement as well as best practices.

The document was written by the European Commission using input from stakeholders. A Technical Working Group, comprising experts and stakeholders of the sector, led by the JRC, discussed and ultimately agreed on the best environmental management practices, sector-specific environmental performance indicators and benchmarks of excellence described in this document; these benchmarks in particular were deemed to be representative of the levels of environmental performance that are achieved by the best performing organisations in the sector.

The SRD aims to help and support all organisations that intend to improve their environmental performance by providing ideas and inspiration as well as practical and technical guidance.

The SRD is primarily addressed to organisations that are already registered with EMAS; secondly to organisations that are considering registering with EMAS in the future; and thirdly to all organisations that wish to learn more about best environmental management practices in order to improve their environmental performance. Consequently, the objective of this document is to support all organisations in the car manufacturing sector to focus on relevant environmental aspects, both direct and indirect, and to find information on best environmental management practices, as well as appropriate sector-specific environmental performance indicators to measure their environmental performance, and benchmarks of excellence.

How SRDs should be taken into account by EMAS-registered organisations:

Pursuant to Regulation (EC) No 1221/2009, EMAS-registered organisations are to take SRDs into account at two different levels:

1. When developing and implementing their environmental management system in light of the environmental reviews (Article 4(1)(b)):

⁽¹⁾ The scientific and policy report is publicly available on the JRC website at the following address: http://susproc.jrc.ec.europa.eu/activities/emas/documents/BEMP_CarManufacturing.pdf. The conclusions on best environmental management practices and their applicability as well as the identified specific environmental performance indicators and the benchmarks of excellence contained in this reference document are based on the findings documented in the scientific and policy report. All the background information and technical details can be found there.

⁽²⁾ Council Regulation (EEC) No 1836/93 of 29 June 1993 allowing voluntary participation by companies in the industrial sector in a Community eco-management and audit scheme (OJ L 168, 10.7.1993, p. 1).

⁽³⁾ Regulation (EC) No 761/2001 of the European Parliament and of the Council of 19 March 2001 allowing voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) (OJ L 114, 24.4.2001, p. 1).

Organisations should use relevant elements of the SRD when defining and reviewing their environmental targets and objectives in accordance with the relevant environmental aspects identified in the environmental review and policy, as well as when deciding on the actions to implement to improve their environmental performance.

2. When preparing the environmental statement (*Article 4(1)(d) and Article 4(4)*):

- (a) Organisations should consider the relevant sector-specific environmental performance indicators in the SRD when choosing the indicators⁽⁴⁾ to use for their reporting of environmental performance.

When choosing the set of indicators for reporting, they should take into account the indicators proposed in the corresponding SRD and their relevance with regards to the significant environmental aspects identified by the organisation in its environmental review. Indicators need only be taken into account where relevant to those environmental aspects that are judged as being most significant in the environmental review.

- (b) When reporting on environmental performance and on other factors regarding environmental performance, organisations should mention in the environmental statement how the relevant best environmental management practices and, if available, benchmarks of excellence have been taken into account.

They should describe how relevant best environmental management practices and benchmarks of excellence (which provide an indication of the environmental performance level that is achieved by best performers) were used to identify measures and actions, and possibly to set priorities, to (further) improve their environmental performance. However, implementing best environmental management practices or meeting the identified benchmarks of excellence is not mandatory, because the voluntary character of EMAS leaves the assessment of the feasibility of the benchmarks and of the implementation of the best practices, in terms of costs and benefits, to the organisations themselves.

Similarly to environmental performance indicators, the relevance and applicability of the best environmental management practices and benchmarks of excellence should be assessed by the organisation according to the significant environmental aspects identified by the organisation in its environmental review, as well as technical and financial aspects.

Elements of SRDs (indicators, BEMPs or benchmarks of excellence) not considered relevant with regards to the significant environmental aspects identified by the organisation in its environmental review should not be reported or described in the environmental statement.

EMAS participation is an ongoing process. Every time an organisation plans to improve its environmental performance (and reviews its environmental performance) it shall consult the SRD on specific topics to find inspiration about which issues to tackle next in a step-wise approach.

EMAS environmental verifiers shall check if and how the SRD was taken into account by the organisation when preparing its environmental statement (Article 18(5)(d) of Regulation (EC) No 1221/2009).

⁽⁴⁾ According to Annex IV (B.e.) of the EMAS Regulation, the environmental statement shall contain 'a summary of the data available on the performance of the organisation against its environmental objectives and targets with respect to its significant environmental impacts. Reporting shall be on the core indicators and on other relevant existing environmental performance indicators as set out in Section C'. Annex IV — Section C states that 'each organisation shall also report annually on its performance relating to the more specific environmental aspects as identified in its environmental statement and, where available, take account of sectoral reference documents as referred to in Article 46.'

When undertaking an audit, accredited environmental verifiers will need evidence from the organisation of how the relevant elements of the SRD have been selected in light of the environmental review and taken into account. They shall not check compliance with the described benchmarks of excellence, but they shall verify evidence on how the SRD was used as a guide to identify indicators and proper voluntary measures that the organisation can implement to improve its environmental performance.

Given the voluntary nature of EMAS and SRD, no disproportionate burdens should be put on the organisations to provide such evidence. In particular, verifiers shall not require an individual justification for each of the best practices, sector-specific environmental performance indicators and benchmarks of excellence which are mentioned in the SRD and not considered relevant by the organisation in light of its environmental review. Nevertheless, they could suggest relevant additional elements for the organisation to take into account in the future as further evidence of its commitment to continuous performance improvement.

Structure of the sectoral reference document

This document consists of five sections. Section 1 introduces EMAS' legal background and describes how to use this document, while section 2 defines the scope of this SRD. Section 3 and 4 briefly describes the different Best Environmental Management Practices (BEMPs)⁽⁵⁾ together with information on their applicability, for the manufacturing and end-of-life vehicle (ELV) subsector respectively. When specific environmental performance indicators and benchmarks of excellence could be formulated for a particular BEMP, these are also given. However, defining benchmarks of excellence was not possible for all BEMPs either because of the limited availability of data or because the specific conditions of each company and/or plant (diversity of manufacturing processes carried out in each manufacturing facility, level of vertical integration, etc.) vary to such an extent that a benchmark of excellence would not be meaningful. Even when benchmarks of excellence are given, these are not meant as targets for all companies to reach or metrics to compare the environmental performance across companies of the sector, but rather as a measure of what is possible to help individual companies assess the progress they made and motivate them to improve further. Some of the indicators and benchmarks are relevant for more than one BEMP and are thus repeated whenever appropriate. Finally, section 5 presents a comprehensive table with a selection of the most relevant environmental performance indicators, associated explanations and related benchmarks of excellence.

2. SCOPE

This reference document addresses the environmental performance of the car manufacturing sector and some aspects of the end-of-life vehicle handling sector. The target group of this document are companies belonging to the automotive manufacturing sector according to the following NACE codes (according to the statistical classification of economic activities established by Regulation (EC) No 1893/2006 of the European Parliament and of the Council⁽⁶⁾):

- NACE 29.1 Motor vehicle manufacture
- NACE 29.2 Manufacture of bodies for motor vehicles
- NACE 29.3 Manufacture of parts and accessories for motor vehicles
- NACE 38.31 Dismantling of wrecks

In addition to the above, regarding ELV handling two additional activities can be considered which are subsets of wider areas: Recovery of sorted materials (NACE 38.32, including ELV shredding) and Wholesale of waste and scrap (NACE 46.77, including dismantling of ELV for obtaining and re-selling usable parts).

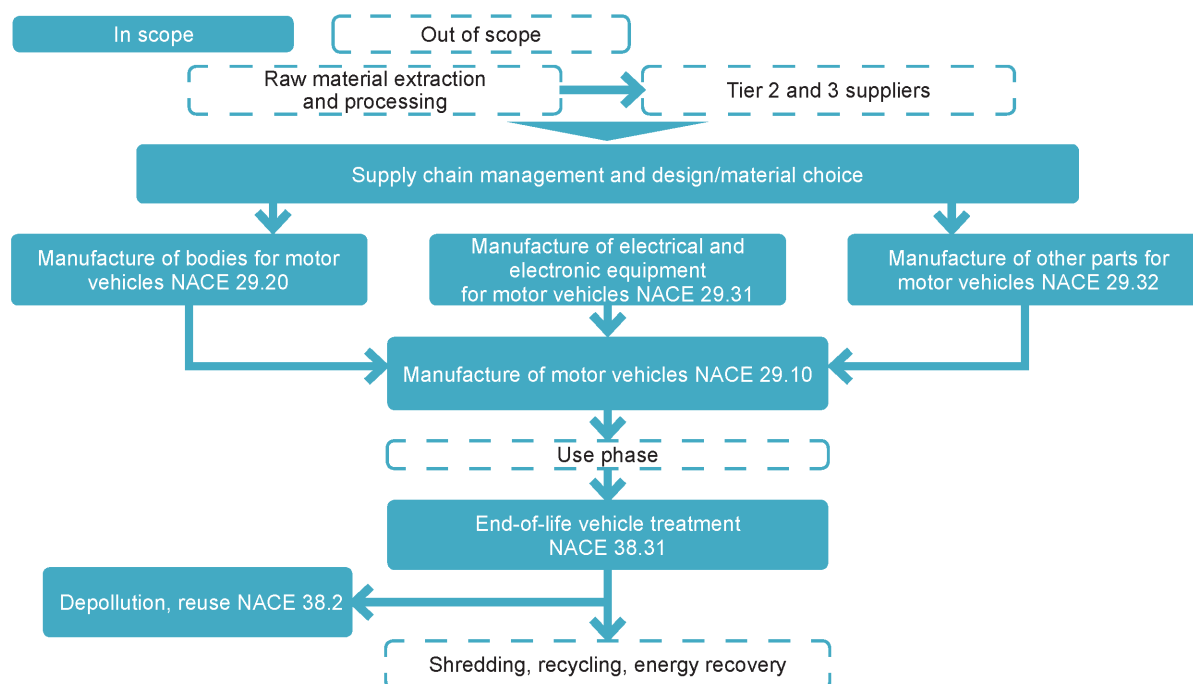
This reference document covers actions that automotive manufacturers and manufacturers of automotive parts and components can implement which results in improvements in the environmental performance over the whole automotive value chain, as presented in Figure 1. In the figure, the key sectors in the scope of this document are highlighted.

⁽⁵⁾ A detailed description of each of the best practices, with practical guidance on how to implement them, is available in the 'Best Practice Report' published by the JRC and available on-line at http://susproc.jrc.ec.europa.eu/activities/emas/documents/BEMP_CarManufacturing.pdf. The reader is invited to consult it if interested to learn more about some of the best practices described in this reference document.

⁽⁶⁾ Regulation (EC) No 1893/2006 of the European Parliament and of the Council of 20 December 2006 establishing the statistical classification of economic activities NACE Revision 2 and amending Council Regulation (EEC) No 3037/90 as well as certain EC Regulations on specific statistical domains (OJ L 393, 30.12.2006, p. 1).

Figure 1

Overview of activities in the automotive manufacturing value chain



Within the scope of car manufacturing activities, many process stages are covered, including: press shop, body-in-white production, paint shop, component and subassembly manufacturing, manufacturing of powertrain and chassis, pre-assembly and trim, and final assembly. In the present document, BEMPs have been developed to be as broadly applicable as possible for different types of plants. However, considering broad variations in vertical integration of the above activities within the same plant, direct evaluation and comparison of environmental performance between plants is difficult; therefore, the applicability and relevance of the best practices (as well as indicators and benchmarks) will have to be assessed in view of the characteristics of each facility.

The following table (Table 1) presents the most significant direct and indirect environmental aspects for the car manufacturing sector and which ones are included in the scope of this reference document. Additionally, Table 1 presents the main environmental pressures related to the most relevant environmental aspects and how these are tackled in this document: they are addressed either by BEMPs described in Sections 3 and 4 or by making reference to other available reference documents such as the Best Available Techniques (BAT) Reference Documents (BREFs⁽⁷⁾, referenced here by their code).

⁽⁷⁾ BREFs: Best Available Techniques Reference Documents. For more information on the content of the Best Available Techniques Reference Documents and full explanation of terms, acronyms and document codes, refer to the European Integrated Pollution Prevention and Control Bureau website: <http://eippcb.jrc.ec.europa.eu/>

Table 1

The most significant environmental aspects and pressures for the car manufacturing sector and how these are addressed in this reference document

Main environmental aspect	Related environmental pressure					BEMPs
	Energy/climate change	Resources/waste	Water	Emissions	Biodiversity	
Supply chain management						BEMPs on supply chain management (Section 3.6)
Engineering and design						BEMP on design for sustainability (Section 3.6.3) BEMP on remanufacturing of components (Section 3.7.1)
Manufacturing and assembly stage						
Press shop						Reference to the BEMPs for the Fabricated Metal Products manufacturing sector ⁽¹⁾ BEMPs for environmental, energy, waste, water and biodiversity management (Sections 3.1, 3.2, 3.3, 3.4, 3.5)
Body-in-white						BEMPs for environmental, energy, waste, water and biodiversity management (Sections 3.1, 3.2, 3.3, 3.4, 3.5)
Paint shop						Reference to BAT in BREFs for STS, STM
Manufacture of powertrain and chassis						Reference to the BEMPs for the Fabricated Metal Products manufacturing sector BEMPs for environmental, energy, waste, water and biodiversity management (Sections 3.1, 3.2, 3.3, 3.4, 3.5)
Manufacture of other components						Reference to BAT in BREFs for FMP, SF, IS, TAN, GLS, POL, TXT etc. Reference to the BEMPs for the EEE manufacturing sector ⁽²⁾

Main environmental aspect	Related environmental pressure					BEMPs
	Energy/climate change	Resources/waste	Water	Emissions	Biodiversity	
Assembly lines						BEMPs for environmental, energy, waste, water and biodiversity management (Sections 3.1, 3.2, 3.3, 3.4, 3.5)
Plant infrastructure						BEMPs for environmental, energy, waste, water and biodiversity management (Sections 3.1, 3.2, 3.3, 3.4, 3.5)
Use phase						Out of scope, see Figure 1
End-of-life Vehicles (ELVs) stage						
Depollution						Reference to Directives 2000/53/EC and 2006/66/EC of the European Parliament and of the Council ⁽³⁾ BEMP on implementing an advanced environmental management system (Section 3.1.1) BEMP on enhanced depollution of vehicles (Section 4.2.1)
Salvage and reuse						Directives 2000/53/EC and 2006/66/EC (see references above) BEMP on implementing an advanced environmental management system (Section 3.1.1) BEMP on component and material take-back networks (Section 4.1.1)
Dismantling and recycling of components						Directives 2000/53/EC and 2006/66/EC (see references above) BEMP on implementing an advanced environmental management system (Section 3.1.1) BEMP on plastic and composite parts (Section 4.2.2)

Main environmental aspect	Related environmental pressure					BEMPs
	Energy/climate change	Resources/waste	Water	Emissions	Biodiversity	
Post-shredder treatment						Out of scope (Reference to BAT in the BREF for WT), see Figure 1

⁽¹⁾ The Best Environmental Management Practices for the Fabricated Metal Products manufacturing sector are currently under identification and more information and updates are published at: http://susproc.jrc.ec.europa.eu/activities/emas/fab_metal_prod.html.

⁽²⁾ The Best Environmental Management Practices for the Electrical and Electronic Equipment manufacturing sector are currently under identification and more information and updates are published at: <http://susproc.jrc.ec.europa.eu/activities/emas/eeem.html>.

⁽³⁾ Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC (OJ L 266, 26.9.2006, p. 1), known as the Batteries Directive.

The environmental aspects presented in Table 1 were selected as the most commonly relevant in the sector. However, the environmental aspects to be managed by specific companies need to be assessed on a case by case basis.

In addition, the implementation of BEMPs remains a voluntary process which has to be adapted to the specific situation of each organisation. It is therefore important for stakeholders to prioritise the BEMPs which are most likely to be useful for them. The following table illustrates the specific stakeholders concerned by the present document which are most likely to find the BEMPs in each section of relevance:

Table 2

Major target stakeholders per BEMP group (X = main target, (x) = also potentially relevant)

	Area	Key aspect	Stakeholders					
			OEMs ⁽¹⁾	Tier 1 suppliers	Tier 2 & other suppliers	Remanufacturers	ATFs ⁽²⁾	Shredders
MANUFACTURING	CROSS CUTTING MANUFACTURING	Environmental management	X	X	X	X	X	(x)
		Energy management	X	X	X	X	X	(x)
		Waste management	X	X	X	X	X	(x)
		Water management	X	X	X	X	X	(x)
		Biodiversity	X	X	X	X	X	(x)
	SUPPLY CHAIN, DESIGN, AND REMANUFACTURING	Supply Chain Management, logistics and design	X	X	X			
		Remanufacturing	(x)			X		

	Area	Key aspect	Stakeholders					
			OEMs ⁽¹⁾	Tier 1 suppliers	Tier 2 & other suppliers	Remanufacturers	ATFs ⁽²⁾	Shredders
END OF LIFE VEHICLE HANDLING	ELV logistics	Collection				(x)	X	
	ELV treatment						X	(x)

⁽¹⁾ OEMs = Original Equipment Manufacturers, i.e. vehicle manufacturers in the automotive context.

⁽²⁾ ATFs = Authorised Treatment Facilities as defined in Directive 2000/53/EC on end-of life vehicles.

3. BEST ENVIRONMENTAL MANAGEMENT PRACTICES, SECTOR ENVIRONMENTAL PERFORMANCE INDICATORS AND BENCHMARKS OF EXCELLENCE FOR THE CAR MANUFACTURING SECTOR

3.1. BEMPs for environmental management

This section is relevant for automotive vehicles, parts and components manufacturers as well as broadly relevant for authorised end-of-life vehicle treatment facilities.

3.1.1. Implementing an advanced environmental management system

BEMP is to implement an advanced environmental management system (EMS) across all sites of the company. This enables continuous monitoring and improvement across all most significant environmental aspects.

An EMS is a voluntary tool that helps organisations to develop, implement, maintain, review and monitor an environmental policy and improve their environmental performance. Advanced systems can be implemented according to ISO 14001-2015 or preferably EMAS, which are internationally recognised systems certified or verified by a third party, and focus on continuous improvement and benchmarking of the organisation's environmental performance.

Applicability

An EMS is typically suitable for all organisations and sites. The scope and nature of the EMS may vary depending on the scale and complexity of the organisation and of its processes, as well as the specific environmental impacts involved. In some cases, aspects of water management, biodiversity or land contamination may not be covered or monitored in EMSs implemented by firms in the automotive sector; this reference document (Sections 3.2, 3.3, 3.4 and 3.5) may offer useful guidance on these aspects.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmark of excellence
(i1) Sites with an advanced environmental management system (% of facilities/operations) (i2) Number of environmental performance indicators that are in general use throughout the whole organisation and/or which are reported on in environmental statements; (i3) Use of internal or external benchmarks to drive environmental performance (Y/N)	(b1) An advanced environmental management system is implemented across all production sites globally

3.2. BEMPs for energy management

This section is relevant for automotive vehicles, parts and components manufacturers. The main principles are also broadly relevant for authorised end-of-life vehicle treatment facilities.

3.2.1. Implementing detailed energy monitoring and management systems

BEMP is to implement across manufacturing sites detailed energy monitoring at the process level, in conjunction with an energy management system that is certified or verified by a third party, in order to optimise energy consumption.

Best practice energy management plans include the following aspects and these are formalised according to a management system that requires organisational improvements, such as a system certified ISO 50001 or integrated in EMAS:

- Establishing an energy policy, strategy, and action plan;
- Gaining active commitment from senior management;
- Performance measurement and monitoring;
- Staff training;
- Communication;
- Continuous improvement;
- Investment.

Applicability

An energy management system certified ISO 50001 or integrated in EMAS is applicable to any plant or site.

Introducing detailed energy monitoring and management systems, while not systematically essential, can be beneficial for any facility and should be considered at the appropriate level to promote action.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i4) Number of facilities with detailed energy monitoring systems (# or % of facilities/operations) (i5) Number of facilities with an energy management system certified ISO 50001 or integrated in EMAS (# or % of facilities/operations)	(b2) Specific energy management plans are implemented across all sites (organisation level) (b3) Detailed monitoring per process is implemented on-site (site level) (b4) The plant implements energy management controls, e. g. to switch off areas of the plant during non-productive times for sites with detailed monitoring (site level)

3.2.2. Increasing the efficiency of energy-using processes

BEMP is to ensure that high levels of energy efficiency are maintained, by conducting regular reviews of energy-using processes and identifying options for improved controls, management, repairs and/or equipment replacement.

Major principles that can be followed to increase energy efficiency across facilities are:

- Carrying out energy performance reviews;
- Automation and timing for base-load reduction;
- Zoning;
- Checks for leaks and losses;
- Installing insulation over pipes and equipment;
- Seeking opportunities to install heat recovery systems such as heat exchangers;
- Installing cogeneration systems (combined heat and power (CHP));
- Retrofitting;
- Switching or combining energy sources.

Applicability

The techniques mentioned in this BEMP are applicable in principle for both new plants and existing installations. However, the potential for optimisation is usually greater in existing installations which have developed organically over many years to meet the evolving constraints of production, where synergies and rationalisations may deliver more obvious results.

Not all plants will be able to implement cogeneration (CHP): in plants with little thermal process or heat requirements, cogeneration will not be a cost-effective strategy.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i6) Implementation of regular reviews of systems, automation, repair, maintenance and upgrades (% of sites)	—
(i7) Overall energy use (kWh) per functional unit ⁽¹⁾	

⁽¹⁾ In this and in several other indicators, the term 'functional unit' refers to a unit of output, of activity or resource use chosen by each organisation to reflect what is most relevant for its specific case (and can be adapted depending on the site, environmental aspect considered, etc.). Typical metrics (usually counted over a reference period, e.g. 1 year) in use through industry as functional units include e.g.:

- number of units (vehicles, engines, gearboxes, parts...) produced
- turnover in EUR
- added value in EUR
- output measured in kg
- full time equivalent (FTE) employees
- man-hours worked

3.2.3. Renewable and alternative energy use

BEMP is to use renewable energy, generated on-site or off-site, to meet the energy needs of an automotive manufacturing facility.

After striving to reduce energy use as much as possible (see Section 3.2.2), renewable or alternative energy sources that can be considered include:

- On-site renewables, e.g. solar thermal, solar photovoltaic panels, wind turbines, geothermal, biomass or hydroelectric generation;
- Alternative (potentially lower-carbon) on-site sources such as combined heat and power (CHP) or trigeneration;
- Purchase of off-site renewable energy, either directly or through major utilities.

Applicability

The achievability, cost and technologies required will vary significantly depending on the local renewable resource. The feasibility of on-site renewable energy generation varies widely according to factors specific to the general area and the site itself such as climate, terrain and soil, shading and exposure and available space. Planning permits can also be an administrative hurdle specific to the jurisdiction.

Off-site energy purchase is more generally applicable, either through partnering with energy producers (e.g. on a local scale) or simply selecting a renewable energy option from a utility company, which is becoming a mainstream offering in most Member States.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i8) Share of production sites assessed for potential and opportunities for use of renewable energy sources (%)	(b5) All production sites are assessed for potential use of renewable energy sources
(i9) Share of site energy use met by renewable sources (%)	(b6) Energy use is reported, declaring the share of fossil and non-fossil energy
(i10) Energy consumption from fossil fuels (MWh or TJ) per functional unit	(b7) A policy is in place to drive an increase in renewable energy use

3.2.4. Optimisation of lighting in automotive manufacturing plants

BEMP is to reduce energy use for lighting through a combination of optimal design, positioning, using efficient lighting technologies and zonal management strategies.

An integrated approach to optimise lighting energy efficiency needs to take into account the following elements:

- Space design: wherever possible, using daylight in combination with artificial light;
- Optimising the positioning and distribution of luminaires: height and space between luminaires, within the constraints on maintenance, cleaning, reparability and cost;
- Increasing the efficiency of lighting devices: choice of efficient technical solutions (at system level) which deliver sufficient brightness for safe working;

— Management of lighting on a ‘zonal’ basis: lighting is switched on or off according to requirements and presence.

Combining the measures above can be the most effective and comprehensive way to reduce the energy use for lighting.

Applicability

This BEMP is generally applicable, although different lighting technologies have different fields of application and limitations which may make some of them unsuitable for certain work environments.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i11) Implementation of improved positioning, energy-efficient lighting (% of lighting areas within a site, % of total sites).	(b8) The most energy efficient lighting solutions appropriate to specific work place requirements are implemented at all sites
(i12) Implementation of zonal strategies for lighting (% of lighting areas within a site, % of total sites).	(b9) Zoning schemes are introduced in all sites
(i13) Energy use of lighting equipment ⁽¹⁾ (kWh/year for a plant)	
(i14) Average efficacy of luminaires throughout plant (lm/W)	

⁽¹⁾ If measured at detailed level.

3.2.5. Rational and efficient use of compressed air

BEMP is to reduce energy consumption by mapping and assessing the use of compressed air, by optimising compressed air systems and eliminating leaks, by better matching supply and demand of air, by increasing the energy efficiency of compressors and by implementing waste heat recovery.

Compressed air usage can be optimised according to a vast portfolio of measures in three areas:

- Demand-side measures:
 - Avoid and replace misuse of compressed air;
 - Review usage of compressed air tools;
 - Monitor and control demand;
 - Set up awareness programmes;
- Distribution network and system measures:
 - Identify and minimise leaks;
 - Depressurisation;
 - Zoning;
 - Use of valves;
- Supply-side measures:
 - Size and manage compressor system according to demand;
 - Increase the overall energy efficiency of the compressed air system;

- Regular inspection of system pressure;
- Increase the energy efficiency of major system components;
- Regular filter inspection;
- Energy efficient dryers and optimal drain selection;
- Install waste heat recovery.

Applicability

The approaches for improving the energy efficiency of compressed air systems can be applied by all companies that have such a system at their disposal, regardless of size.

The substitution of compressed air devices as well as the elimination of leakages is broadly applicable for all systems, independent of their age and current state.

Concerning the optimisation of systems design, the recommendations are especially relevant for systems that have expanded over decades — it is estimated that this approach is applicable for at least 50 % of all compressed air systems.

Regarding the use of waste heat, a continuous demand for process heat is necessary in order to realise the existing energy and cost savings potentials.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i15) Electricity use of the compressed air system per unit of volume at the point of end use (kWh/m ³ of delivered compressed air)	(b10) The energy use of the compressed air system is lower than 0,11 kWh/m³ of compressed air delivered, for large installations operating at a gauge pressure of 6,5 bar, with volume flow normalised at 1 013 mbar and 20 °C, and pressure deviations not exceeding 0,2 bar. (b11) After all air consumers are switched off, the network pressure remains stable and the compressors (on standby) do not switch to load condition.

3.2.6. Optimisation of electric motor usage

BEMP is to reduce electricity consumption through the optimal use of electric motors, in particular using variable speed drives to adapt motor speed to demand, typically for applications such as pumps.

Electric motors are present in most manufacturing processes, and can be optimised for higher efficiency. Preliminary steps include exploring possible options for reducing the motors' load, and a review of power quality, motor controls and motor and transmission efficiency. Replacement can be considered, as modern, energy-efficient motors may reduce energy consumption by up to 40 % over older models.

A further improvement for variable speed/load applications is to install variable-speed drives (VSDs) to adapt the operation of the motor electronically with minimal losses. This is particularly relevant, and holds the largest savings potential, for common application such as pumps and fans. Short payback often makes these investments economically attractive.

Applicability

The type of load and appropriate electric motor must be considered first before assessing the improvement potential of optimisation. Retrofitting constitutes the biggest potential for optimisation, after evaluating whether a motor of smaller nominal power can be installed (if the load is reduced) and considering e.g. size, weight and starting capability. However, also in new build or new purchases, adapting the choice of motor as closely as possible to usage will have the potential for optimised operation.

When considering the VSD installation, the main negative effects that need to be considered are harmonic distortion, cooling problems at low rotational speeds, and mechanical resonance at certain rotational speeds.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i16) Share of electric motors with VSD installed (% of total installed power or of total number)	—
(i17) Share of pumps with VSD installed (% of total installed power or of total number)	
(i18) Average pump efficiency (%)	

3.3. BEMPs for waste management

This section is relevant for automotive vehicles, parts and components manufacturers as well as broadly relevant for authorised end-of-life vehicle treatment facilities.

3.3.1. Waste prevention and management

BEMP is to set up an overall organisational waste management strategy with high level targets for waste minimisation, and to apply it at the site level with tailored waste management plans that minimise waste production during operations and establish strategic partnerships in order to find markets for the remaining waste fractions.

An effective organisational waste management strategy aims to avoid ultimate disposal by following the waste hierarchy ⁽⁸⁾ i.e. in order of priority:

- Reduce through forward planning, prolonging the product's life before it becomes waste, improved methods of manufacturing, and the management of supply chain waste;
- Reuse materials in their current form;
- Recycle by putting in place:
 - Collection and segregation;
 - Measurement and monitoring of waste generation;
 - Procedures and methodologies;

⁽⁸⁾ Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (OJ L 312, 22.11.2008, p. 3), known as the Waste Framework Directive, introduces an order of preference for action to reduce and manage waste. This is known as the waste hierarchy. It set the highest priority on waste prevention, followed by waste re-use, then recycling and then (energy) recovery of waste fractions that cannot be prevented, re-used or recycled. Finally, waste disposal is only to be considered when none of the previous routes are possible.

- Provision of waste logistics;
- Partnerships and stakeholder engagement;
- Recover energy from waste through combustion or more advanced techniques.

Applicability

Limited local recycling infrastructure and waste disposal regulations in certain regions can be a barrier to diverting waste from landfill. In those cases, working with local stakeholders is an important aspect of the waste management plan.

The choice of the most appropriate waste treatment options involves consideration of logistics as well as material properties and economic value.

SMEs may not be able to afford the capital cost of some waste reduction techniques which can require new equipment, training or software.

Finally, highly ambitious objectives such as zero waste to landfill may not be achievable for some facilities depending on the degree of vertical integration of the processes in the plant.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i19) Waste generation per functional unit (kg/functional unit)	(b12) Waste management plans introduced [in all sites] (b13) Zero waste sent to landfill from all production and non-production activities/sites
(i20) Hazardous waste generation per functional unit (kg/functional unit)	
(i21) Waste sent to specific streams, including recycling, energy recovery and landfill (kg/functional unit, % total waste).	
(i22) Establishment and implementation of an overarching waste strategy with monitoring and targets for improvements (Y/N)	
(i23) [For multi-site organisations] Number of sites with advanced waste management plans in place (#)	
(i24) [For multi-site organisations] Number of sites achieving zero waste to landfill (#)	

3.4. BEMPs for water management

This section is relevant for automotive vehicles, parts and components manufacturers. The main principles are also broadly relevant for authorised end-of-life vehicle treatment facilities.

3.4.1. Water use strategy and management

Water management is an issue of increasing concern that is typically not covered in detail in standard environmental management systems. Therefore BEMP is to implement monitoring and to conduct a review of water management issues according to a recognised consolidated framework for water management which allows organisations to:

- Assess water usage and discharge;
- Assess risks in local watershed and supply chain;
- Create a plan on how to use water more efficiently and improve wastewater discharge;
- Collaborate with the supply chain and other organisations;

- Hold the organisation and others accountable;
- Communicate results.

Applicability

Water management is a highly localised issue: the same level of water consumption could put extreme strain on the available water resources in water-scarce regions, while presenting no issues in areas with abundant water supplies. The efforts put by companies in water management needs thus to be proportional to the local situation.

There are challenges associated with collecting sufficient data for a full water impact assessment. Therefore organisations should prioritise their efforts to focus on the most water-intensive processes, areas and products, as well as those in areas that are considered to be at high risk of water scarcity.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i25) Water use per functional unit (m ³ /functional unit)	(b14) Introduction of a water strategy according to a recognised tool, such as the CEO Water Mandate, integrating an assessment of water scarcity (b15) Water use on-site is measured per site and per process, if appropriate, using automated software
(i26) Sites that have conducted a water strategy review (% of facilities/operations)	
(i27) Sites that have monitoring for water use (%)	
(i28) Sites that have separate water monitoring for production processes and sanitary use (%)	

3.4.2. Water-saving opportunities in automotive plants

BEMP is to minimise water use at all facilities, regularly review the implementation of water efficiency measures and ensure that the majority of practices and appliances are classified as highly efficient.

The potential of water saving throughout the plant ⁽⁹⁾ can be captured by:

- Avoiding water use:
 - Dry sweep all areas before hosing;
 - Eliminate leaks;
 - Use alternatives to liquid ring pumps;
- Reducing water use:
 - Improve efficiency of operations;
 - Install flow restrictors on tap water supply line;
 - Use water efficient nozzles for spray rinsing/hosing;
 - Use timer rinse controls;

⁽⁹⁾ This BEMP does not specifically address paint shops (where significant water savings can be realised), as existing guidance is available in the relevant BREFs (STS, STM).

- Install water efficient staff amenities;
- Use ultrasonic cleaning processes;
- Counter-flow rinsing;
- Inter-stage rinsing.

Applicability

Water-saving devices are broadly applicable and do not compromise performance, if chosen and installed correctly.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i25) Water use per functional unit (m ³ /functional unit)	(b16) All new sites are designed with water-saving sanitary devices and retrofitting of water-saving devices is phased in across all existing sites
(i29) Share of operations in existing sites retrofitted with water-saving sanitary devices and processes (%)	
(i30) Share of new sites designed with water-saving devices and processes (%)	

3.4.3. Water recycling and rainwater harvesting

BEMP is to avoid/eliminate the use of high-quality water in processes where this is not necessary, as well as increase reuse and recycling to meet remaining needs.

For many uses such as cooling water, toilet and urinal flushing, vehicle/component washing and non-crop irrigation, it is possible to replace drinking, or high-quality water with recovered water from rain collection or water recycled from other uses.

Installing these systems usually requires the following elements:

- for wastewater recycling systems:
 - pre-treatment tanks;
 - treatment system;
 - pumping;
- for rainwater harvesting systems:
 - catchment area;
 - conveyance system;
 - storage device;
 - distribution system.

Applicability

Water recycling systems can be designed into all new buildings. Retrofitting to existing buildings is expensive and may be impractical unless the building is undergoing extensive renovation.

The economic feasibility of rainwater harvesting systems is highly dependent on the climate.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i25) Water use per functional unit (m ³ /functional unit)	(b17) 'Closed loop' water recycling is implemented with recovery rate of at least 90 % where feasible (b18) 30 % water needs are met by harvested water (in regions with sufficient rainfall)
(i31) Installation of a wastewater recycling system (Y/N)	
(i32) Installation of a rainwater recycling system (Y/N)	
(i33) Yearly quantity of rainwater use and wastewater reuse (m ³ /yr)	
(i34) Percentage of total water use met by recycled rain- or wastewater (%).	

3.4.4. Green roofs for storm water management

BEMP is to install or retrofit green roofs on industrial sites, particularly in environmentally sensitive areas where management of storm water runoff is important.

Installing green roofs where structurally possible can contribute to the following objectives:

- Water attenuation especially from severe weather events;
- Increased roof lifespan (reduced material consumption);
- Insulating effect (reduce HVAC energy consumption);
- Biodiversity conservation;
- Improved water quality.

Applicability

Green roofs are applicable to many existing and new building designs, but in practice, few locations are eligible for a wide-scale deployment of the solution. Limitations include the actual risk of storm events; structural constraints on the building; access to sunlight; moisture; waterproofing; existing roof systems; and the management of collected rainwater.

In addition, this use of the roof has to be weighed against other environmentally beneficial uses, such as the installation of solar (thermal/PV) energy systems and daylight inflow.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i35) Percentage of sites that are suitable for green roofs with green roofs installed (%)	—
(i36) Water holding capacity of the green roof: share of water retention (%), water run off (m ³);	
(i37) Cooling effect: reduction in energy demand for HVAC (MJ);	
(i38) Qualitative biodiversity indicators (e.g. number of species living in the roof), depending on local conditions.	

3.5. BEMPs for biodiversity management

This section is relevant for automotive vehicles, parts and components manufacturers. The main principles are also broadly relevant for authorised end-of-life vehicle treatment facilities.

3.5.1. Review and strategy of ecosystems and biodiversity management throughout the value chain

BEMP is to conduct an ecosystem management review so that the impacts of ecosystem services throughout the value chain can be clearly understood, and to work with relevant stakeholders to minimise any issues.

Organisations can follow methodologies such as the Corporate Ecosystem Services Review (developed by the World Resources Institute with the WBCSD), which consists of five steps:

- Select the scope;
- Identify priority ecosystem services (qualitative);
- Analyse trends in priority services;
- Identify business risks and opportunities;
- Develop strategies.

Applicability

Ecosystem reviews can be readily implemented by companies of all sizes, with varying degrees of detail and depth in the supply chain. The approaches outlined consist in mainstreaming biodiversity management in the (environmental) management plan of the organisation, and can therefore readily link with many other existing company processes and analytical techniques, such as life cycle assessments, land management plans, economic impact assessments, company reporting, and sustainability appraisals.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i39) Application of methodologies to assess ecosystem services to the value chain (Y/N or % coverage);	(b19) A high-level ecosystem review is conducted across the value chain, followed by a more detailed ecosystem review in identified high risk areas
(i40) Coverage of relevant scope, as determined by prioritisation (Y/N or % coverage).	(b20) Strategies to mitigate issues in the identified priority areas of the supply chain are developed, in collaboration with local stakeholders and external experts

3.5.2. Biodiversity management at site level

BEMP is to improve direct impacts on biodiversity on company premises by measuring, managing and reporting on biodiversity efforts, working with local stakeholders.

Three key steps are essential in improving biodiversity impacts on site:

- Measuring biodiversity to track an organisation's positive and negative impacts on biodiversity, e.g. focussing on land use, environmental impacts and protectable species. Best practice includes e.g. location-based biodiversity or risk screenings, including assessment of the surrounding areas, and measurement according to indicators and species inventories.

- Management and collaboration with stakeholders: Managing the site to promote and maintain biodiversity, conducting ecological compensation measures, while working with specialist organisations involved in biodiversity and educating staff and contractors.
- Reporting: sharing information with stakeholders about an organisation's activities, impacts, and performance in relation to biodiversity.

Applicability

Many of the approaches are generally applicable and can be introduced at any time during site operation. Existing sites may have little or no open space available for new development, although some solutions can make use of already constructed surfaces (see Section 3.4.4).

One issue facing the organisations implementing this BEMP is the threat that the areas dedicated to biodiversity may become protected, impending future use for e.g. planned long-term extensions.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i41) Number of collaboration projects with stakeholders to address biodiversity issues (#)	(b21) A comprehensive biodiversity plan is in place to ensure systematic incorporation of biodiversity issues through measurement, monitoring and reporting
(i42) Procedure/instruments are in place to analyse biodiversity related feedback from customers, stakeholder, suppliers (Y/N).	(b22) Cooperation with experts and local stakeholders is in place
(i43) Inventory of land or other areas, owned, leased or managed by the company in or adjacent to protected areas or areas of high biodiversity value (m ²).	
(i44) Plan for biodiversity friendly gardening in place for premises or other areas, owned, leased or managed by the company (Y/N).	
(i45) Biodiversity Index (to be developed according to local conditions)	

3.6. BEMPs for value chain management and design

This section is relevant for automotive vehicles, parts and components manufacturers.

3.6.1. Promoting environmental improvements along the supply chain

BEMP is to require all major suppliers to have certified environmental management systems, set targets for environmental criteria and conduct audits of high risk suppliers to ensure compliance. This is supported by training of and collaboration with suppliers to ensure that their environmental performance improves.

Front runner organisations strive to improve environmental performance in their supply chain by:

- Tracking materials using the IMDS (International Material Data System);

- Requiring direct suppliers to have certified or verified environmental management systems;
- Setting environmental improvement goals and collaborating with Tier 1 suppliers on how to achieve them (typically to: reduce waste and increase recycling; reduce energy consumption and CO₂ emissions; increase the percentage of sustainable materials in purchased components; and improve biodiversity);
- Supporting suppliers to improve their environmental impact;
- Monitoring and enforcement.

Applicability

Many OEMs require all of their Tier 1 suppliers to agree to the same general environmental code of conduct that is integrated into purchasing agreements. Initially it may be beneficial to concentrate on Tier 1 suppliers that represent the largest share of total purchasing budget or those with high environmental impacts. Auditing of Tier 1 suppliers requires a significant effort that appears feasible only for larger organisations that already practice close inspection of supplier operations. In the longer term the requirements can be rolled out to more suppliers.

Regarding the applicability of this best practice to Tier 1 supplier themselves rather than OEMs, suppliers should take into account the leverage that the organisation is able to use in order to cascade up requirements to their own suppliers, in view of their own size or purchasing capability and relative weight in their own suppliers' portfolio.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i46) Share of Tier 1 (direct) suppliers (by number or by purchasing budget/value) that comply with required standards according to internal or external audits (%)	(b23) All major suppliers are required to have an environmental management system in order to qualify for purchasing agreements
(i47) Self-assessment questionnaires sent to direct high risk suppliers (Y/N)	(b24) Environmental criteria are set across all environmental impact areas for purchasing agreements
(i48) Direct supplier development and training undertaken (Y/N)	(b25) All direct suppliers are sent self-assessment questionnaires and high risk suppliers are audited by customers or third parties
	(b26) Direct supplier development and training is undertaken
	(b27) Enforcement procedures are defined for non-compliance

3.6.2. Collaborate with suppliers and customers to reduce packaging

BEMP is to reduce and reuse packaging used for materials and components supply.

This best practice is based on the following principles:

- Reduce unnecessary packaging while ensuring adequate functionality (parts integrity, ease of access);
- Investigate alternative materials for packaging which are either less resource intensive, or easier to reuse/recycle;

- Develop reverse logistics for returning empty packaging to suppliers/recuperate from customers in a closed loop;
- Investigate alternative uses for disposable packaging to divert from disposal (higher up in the ‘waste hierarchy’ ⁽¹⁰⁾).

Applicability

These principles are broadly applicable to all packaging currently in use. The concrete feasibility of innovative solutions will be limited by the willingness of suppliers or customers to collaborate with the scheme.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i20) Waste generation per functional unit (kg/functional unit)	—
(i49) Packaging waste generation per functional unit (kg/functional unit)	
(i50) Packaging waste generation per site or maintenance group (kg/site, kg/maintenance group)	

3.6.3. Design for sustainability using Life Cycle Assessment (LCA)

Conducting life cycle assessment (LCA) helps to identify potential improvements and trade-offs between different environmental impacts, as well as helping to avoid shifting environmental burdens from one part of the product life cycle to another.

BEMP is to perform LCAs extensively during the design phase, to support the setting of specific goals for improvement in different environmental impacts and to ensure that these targets are met; and to support decision making by using LCA tools in order to:

- Ensure sustainability of resources;
- Ensure minimal use of resources in production and transportation;
- Ensure minimal use of resources during the use phase;
- Ensure appropriate durability of the product and components;
- Enable disassembly, separation and purification;
- Enable comparisons among different kinds of mobility concepts.

Applicability

In principle, there are no limits to the applicability of LCA to inform design decisions at the level of the vehicle, as well as individual parts and materials. However, most SMEs lack the expertise and resources to address the requests for life cycle environmental performance information, and additional support may be needed.

There are also limits to current LCA methodologies, as some impact categories are not well accounted for in LCA methodologies — for example, biodiversity loss and indirect effects due to displacement of agricultural production.

⁽¹⁰⁾ See Section 3.3.1.

LCA can be an ineffective tool for comparison of vehicles inter-OEM, as the boundaries, parameters and data sets used can differ considerably, even when following ISO standard guidelines. Indeed it was not a goal of the tool when initially developed. However — as is the case for environmental management systems such as EMAS — LCA is very useful to measure the improvement that a company can achieve on the environmental performances of its products, typically with the comparison of a vehicle with its own predecessor of the same product line.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i51) Conducting LCA of the main product lines to support design and development decisions (Y/N)	(b28) LCA is conducted for main product lines according to ISO 14040:2006 standards or equivalent
(i52) Improvements in environmental indicators (CO ₂ , energy consumption, pollution etc.) for new model designs in the main product lines compared to previous model designs (%)	(b29) Targets are set to ensure continuous improvements in the environmental impacts of new vehicle designs
(i53) Conduct comparisons among different kinds of mobility concepts (Y/N)	

3.7. BEMPs for remanufacturing

This section is relevant for automotive vehicles, parts and components manufacturers.

3.7.1. General best practices for remanufacturing components

Achieving greater levels of remanufacturing has a significant impact on the conservation of materials and energy savings.

BEMP is to increase the scale of remanufacturing activities, establishing procedures to ensure the high quality of remanufactured parts while reducing environmental impacts and scaling up activities to cover more components.

Applicability

Typically, remanufacturing is viable for products with higher resale values, and markets for some components are already mature (e.g. starters, alternators etc.). Other areas are at an earlier stage of development (such as electrical and electronic components) where the complexity is much greater, and there is considerable potential for market growth in these areas. Remanufacturing may also be helpful in situations where previous product generations are still in the marketplace and require maintenance, but are no longer in production.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i54) Level of remanufacturing (weight per component (%))	—
(i55) Overall remanufacturing levels (% of recovered components).	

4. BEST ENVIRONMENTAL MANAGEMENT PRACTICES, SECTOR ENVIRONMENTAL PERFORMANCE INDICATORS AND BENCHMARKS OF EXCELLENCE FOR THE END-OF-LIFE VEHICLE HANDLING SECTOR

4.1. BEMPs for ELV collection

This section is relevant for authorised end-of-life vehicle treatment facilities.

4.1.1. Component and material take-back networks

BEMP is to deploy effective take-back networks to increase the rate of reuse, recycling and recovery that is economically achievable when treating ELVs. This involves extensive collaboration between different industry actors to recuperate components, consolidate with other waste streams where possible as well as training and support.

Front-runner authorised treatment facilities have implemented best practice through:

- Collaboration with industry actors: to coordinate the tracking, collection and transportation of components and materials and to ensure that the right incentives are in place for actors in the chain;
- Managing/incentivising product return;
- Consolidation with other waste streams, to reduce the administrative burdens and pool expertise;
- Providing technical support and awareness-raising.

Applicability

The greatest potential environmental gains appear to be in collecting advanced technologies with limited service life (such as hybrid or electric vehicle batteries), as well as components/materials that are less financially attractive to dismantle (such as plastic and glass components). With respect to managing/incentivising product return, the applicability of alternative business models (if at all) depends on local regulation, the customer base, the geographic dispersion and the type of product involved.

In some Member States, take back schemes could face competition from the informal sector for dismantling of ELVs.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i56) Rate of specific products or materials recuperated through ELV networks (%)	(b30) Collaboration and partnerships are in place with local/national organisations to implement take-back networks

4.2. ELV treatment

This section is relevant for authorised end-of-life vehicle treatment facilities.

4.2.1. Enhanced depollution of vehicles

BEMP is to carefully carry out the mandatory depollution of vehicles using specifically designed equipment where possible. Environmental considerations are relevant to contamination of soil and water, but also related to the potential for recuperating materials for reuse and recycling.

Best practice is to have in place effective depollution systems such as:

- Equipment which safely drills fuel tanks and hydraulically removes fuel;
- Drainage/collection equipment for oils, hydraulic fluids etc.; and to remove oil from shock absorbers;
- Tools to remove the catalytic converter;
- Equipment for removal and safe storage of air conditioning gases;
- Equipment for airbag detonation and;

— Equipment for removal of seat belt tensioners;
or to use alternative methods to achieve the same levels of depollution.

Applicability

Depollution rates will be affected by whether an end-of-life vehicle treatment facility specialises in a certain type of vehicle (e.g. vehicle size). Certain other factors will also be required, for instance commercial depollution machines in some cases, or adequate storage and treatment facilities, to ensure depollution is non-hazardous to the environment.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i57) Removal rate of components (%)	(b31) A certified quality management system is in place in the organisation
(i58) Recycling rate of fluids (%)	
(i59) Installation of commercial depollution machine or equally performing equipment (Y/N)	
(i60) Use of mass balancing techniques to monitor depollution rates (Y/N)	
(i61) Adoption of a quality management system (Y/N)	

4.2.2. General best practices for plastic and composite parts

There are two main methods for treating plastic and composite parts — dismantling and recycling of components, and post-shredder recycling. The relative advantages and disadvantages of these methods depend largely on the availability and performance of ELV treatment technologies.

BEMP is therefore to evaluate the pros and cons based on specific information relevant to plastic and composite parts. Front-runner organisations have established closed loop recycling for selected components, and continue to develop new areas to increase the level of recyclability of their vehicles.

Applicability

There is scope for best practice both within the context of pre-shredder and post-shredder recycling pathways.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i62) Consideration of LCA studies to determine optimal material routes according to local factors (Y/N)	—
(i63) Share of components treated according to optimal LCA route (%)	

5. RECOMMENDED SECTOR-SPECIFIC KEY ENVIRONMENTAL PERFORMANCE INDICATORS

The following table lists a selection of key environmental performance indicators for the car manufacturing sector, together with the related benchmarks and reference to the relevant BEMPs. These are a subset of all the indicators mentioned in sections 3 and 4.

#	Recommended Indicator	Common Unit	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related Best Environmental management Practice ⁽²⁾
CAR MANUFACTURING								
1	Sites with an advanced environmental management system	% of facilities/ operations	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	Number of sites with an advanced environmental management system (e.g. EMAS registered or ISO 14001 certified and as described in the BEMP) divided by the total number of sites	Company level	Energy efficiency Material efficiency Water Waste Biodiversity Emissions	An advanced environmental management system is implemented across all production sites globally	BEMP 3.1.1
2	Number of facilities with detailed energy monitoring systems	# of facilities/ operations % of facilities/ operations	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	Number of facilities with adequate energy monitoring systems. This can be also expressed as a share out of the total number of facilities of the company	Company level	Energy efficiency	Specific energy management plans are implemented across all sites Detailed monitoring per process is implemented on-site The plant implements energy management controls, e.g. to switch off areas of the plant during non-productive times for sites with detailed monitoring	BEMP 3.2.1

#	Recommended Indicator	Common Unit	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related Best Environmental management Practice ⁽²⁾
3	Overall energy use per functional unit	kWh/functional unit/year	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	Yearly energy (heat, cold and electricity) used in the production site divided by the functional unit selected (e.g. car vehicles manufactured)	Company level	Energy efficiency	—	BEMP 3.2.2
4	Share of production sites assessed for potential and opportunities for use of renewable energy sources	%	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	Production sites assessed for potential and opportunities for use of renewable energy sources divided by the total number of production sites	Company level	Emissions	All production sites are assessed for potential and opportunities for use of renewable energy sources A policy is in place to drive improvement in renewable energy use	BEMP 3.2.3
5	Share of site energy use met by renewable energy	%	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	Amount of renewable energy used (including both energy generated onsite or purchased) divided by the total energy used on site.	Company level	Emissions	Energy use is reported on, declaring the share of fossil and non-fossil energy	BEMP 3.2.3
6	Energy use of lighting equipment	kWh/year	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	Annual energy use for lighting measured at facility level	Facility level	Energy efficiency Emissions	—	BEMP 3.2.4

#	Recommended Indicator	Common Unit	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related Best Environmental management Practice ⁽²⁾
7	Implementation of improved positioning, energy efficient lighting	% of lighting areas within a site % of total sites	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	Improved positioning and energy-efficient lighting systems are implemented at the facility	Facility level	Energy efficiency Emissions	The most energy efficient lighting solutions appropriate to specific work place requirements are implemented at all sites	BEMP 3.2.4
8	Implementation of zonal strategies for lighting	% of lighting areas within a site % of total sites	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	Management of lighting is implemented on a 'zonal' basis, i.e. with lighting switched on or off according to requirements and presence in each area of the facility	Facility level	Energy efficiency Emissions	Zoning schemes are introduced in all sites according to best practice levels	BEMP 3.2.4
9	Electricity use of the compressed air system per unit of volume at the point of end use	kWh/Nm ³ of delivered compressed air, at the specified operating pressure of the compressed air system	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	Electricity used per standard cubic meter of compressed air delivered at the point of end-use at a stated pressure level	Facility level	Energy efficiency Emissions	The compressed air system has an energy use of less than 0,11 kWh/Nm ³ for a compressed air system operating at a pressure of approx. 6,5 bars	BEMP 3.2.5
10	Share of electric motors with variable speed drives installed	%	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	Number of motors with variable speed drives installed divided by the total number of motors. Alternatively, this indicator can also be calculated by the electric power of the motors with variable speed drives installed divided by the total electric power of all electric motors.	Facility level	Energy efficiency Emissions	—	BEMP 3.2.6

#	Recommended Indicator	Common Unit	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related Best Environmental management Practice ⁽²⁾
11	Waste generation per functional unit	kg/functional unit	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	Total waste generated (i.e. hazardous and non-hazardous) divided by the functional units selected (e.g. car vehicles manufactured)	Facility level	Waste	—	BEMP 3.2.7
12	Establishment and implementation of an overarching waste strategy with monitoring and targets for improvements	Y/N	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	A waste management strategy at site level with monitoring and targets for improvements is adopted	Facility level	Waste	Waste management plans introduced [in all sites]	BEMP 3.3.1
13	Waste sent to specific streams, including recycling, energy recovery and landfill	kg/functional unit	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	Waste generated is monitored and the different quantities sent for recycling, energy recovery and disposal in landfill are recorded	Facility level	Waste	Zero waste sent to landfill from all production and non-production activities/sites	BEMP 3.3.1
14	Water use per functional unit	L/functional unit	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	Total water used at the single facility level divided by the functional units selected (e.g. car vehicles manufactured)	Facility level	Water	Introduction of a water strategy according to a recognised tool, such as the CEO Water Mandate, integrating an assessment of water scarcity Water use on-site is measured per site and per process, optionally using automated software Thresholds for reduction of pollutants in discharged water are set which go beyond minimum legal requirements	BEMPs 3.4.1, 3.4.2, 3.4.3

#	Recommended Indicator	Common Unit	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related Best Environmental management Practice ⁽²⁾
15	Share of operations in existing sites retrofitted with water-saving devices and processes	%	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	Number of operations in existing sites that are retrofitted with water-saving devices and processes out of the total number of operations	Facility level	Water	All new sites are designed with water-saving sanitary devices and retrofitting of water-saving devices is phased in across all existing sites	BEMP 3.4.2
16	Share of new sites designed with water-saving devices and processes	%	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	Number of new sites designed with water-saving devices and processes out of the total number of new sites	Facility level	Water	All new sites are designed with water-saving sanitary devices and retrofitting of water-saving devices is phased in across all existing sites	BEMP 3.4.2
17	Percentage of total water use met by recycled rain- or wastewater	%	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	Amount of water used in the facility which is water recycled in production processes or rain-water harvested from a rainwater harvesting system	Facility level	Water	Closed loop water recycling is implemented with recovery rate of at least 90 %, where feasible 30 % of water used are met by harvested rainwater, only in regions with sufficient rainfall	BEMP 3.4.3

#	Recommended Indicator	Common Unit	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related Best Environmental management Practice ⁽²⁾
18	Application of methodologies to assess ecosystem services to the value chain	Y/N % coverage of value chain	Automotive vehicles, parts and components manufacturers	An assessment of the ecosystem services to the value chain is applied. Additionally, the share of the value chain for which an assessment of the ecosystem services is applied, can be calculated	Company level	Biodiversity	A high-level ecosystem review across the value chain is conducted, followed by a more detailed ecosystem review in identified high risk areas Strategies to mitigate issues in the identified priority areas of the supply chain are developed, in collaboration with local stakeholders and external experts	BEMP 3.5.1
19	Number of projects or collaborations with stakeholders to address biodiversity issues	#	Automotive vehicles, parts and components manufacturers Authorised end-of-life vehicle treatment facilities	The number of different collaboration projects with local stakeholders and experts involved in addressing biodiversity that are in place can be monitored	Facility level	Biodiversity	A comprehensive biodiversity plan is in place to ensure systematic incorporation of biodiversity issues through measurement, monitoring and reporting Cooperation with experts and local stakeholders is in place	BEMP 3.5.2

#	Recommended Indicator	Common Unit	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related Best Environmental management Practice ⁽²⁾
20	Share of Tier 1 (direct) suppliers that comply with required standards according to internal or external audits	%	Automotive vehicles, parts and components manufacturers	Percentage (by number or by value of products purchased) of Tier 1 (direct) suppliers that comply with required standards according to internal or external audits	Company level	Energy efficiency Material efficiency Water Waste Biodiversity Emissions	All major suppliers are required to have an environmental management system in order to qualify for purchasing agreements Environmental criteria are set across all environmental impact areas for purchasing agreements All direct suppliers are sent self-assessment questionnaires and high risk suppliers are audited by third parties Direct supplier development and training is undertaken Enforcement procedures are defined for non-compliance	BEMP 3.6.1
21	Packaging waste generation per functional unit	Kg/functional unit	Automotive vehicles, parts and components manufacturers	Packaging waste generated divided by the functional units selected (e.g. car vehicles manufactured)	Facility level	Waste	—	BEMP 3.6.2
22	Conducting LCA of the main product lines to support design and development decisions	Y/N	Automotive vehicles, parts and components manufacturers	LCA is carried out on the main product lines to support design and development decisions	Company level	Energy efficiency Material efficiency Water Waste Biodiversity Emissions	LCA is conducted for main product lines according to ISO 14040:2006 standards or equivalent	BEMP 3.6.3

#	Recommended Indicator	Common Unit	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related Best Environmental management Practice ⁽²⁾
23	Improvements in environmental indicators (CO ₂ , energy consumption, pollution, etc.) for new model designs in the main product lines compared to previous model designs	%	Automotive vehicles, parts and components manufacturers	Improvements in environmental indicators (CO ₂ , energy consumption, pollution etc.) are set for new model designs in the main product lines compared to previous model designs. This indicator monitors how much different indicators for the product were improved	Company level	Energy efficiency Material efficiency Water Waste Biodiversity Emissions	Targets are set to ensure continuous improvements in the environmental impacts of new vehicle designs	BEMP 3.6.3

END-OF-LIFE VEHICLE HANDLING

24	Rate of specific products or materials recuperated through ELV networks	% (product or material extracted/put on the market)	Authorised end-of-life vehicle treatment facilities	Amount of specific products or materials recuperated through ELV networks divided by the total quantity of materials from ELVs processed	Company level	Waste Material efficiency	Collaboration and partnerships are in place with local/national organisations	BEMP 4.1.1
25	Adoption of a quality management system	Y/N	Authorised end-of-life vehicle treatment facilities	A certified quality management system is in place in the organisation treating end-of-life vehicles	Company level	Waste Material efficiency	A certified quality management system is in place in the organisation	BEMP 4.2.1

#	Recommended Indicator	Common Unit	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related Best Environmental management Practice ⁽²⁾
26	Installation of a commercial depollution machine or equally performing equipment	Y/N	Authorised end-of-life vehicle treatment facilities	A commercial depollution machine or an equally performing equipment is installed at the facility	Facility level	Total annual generation of waste	—	BEMP 4.2.1
27	Consideration of LCA studies to determine optimal material routes according to local factors	Y/N	ATFs	LCA studies are used to determine optimal materials routes (dismantling and recycling of components vs. post-shredder recycling), according to local factors	Company level	Energy efficiency Material efficiency Water Waste Biodiversity Emissions	—	BEMP 4.2.2

⁽¹⁾ EMAS core indicators are listed in Annex IV to Regulation (EU) No 1221/2009 (Section C.2)

⁽²⁾ The numbers refer to the sections in this document.

COMMISSION DECISION (EU) 2019/63

of 19 December 2018

on the sectoral reference document on best environmental management practices, sector environmental performance indicators and benchmarks of excellence for the electrical and electronic equipment manufacturing sector under Regulation (EC) No 1221/2009 of the European Parliament and of the Council on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS)

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EC) No 1221/2009 of the European Parliament and of the Council of 25 November 2009 on the voluntary participation by organisations in a Community eco-management and audit scheme (EMAS), repealing Regulation (EC) No 761/2001 and Commission Decisions 2001/681/EC and 2006/193/EC ⁽¹⁾, and in particular Article 46 (1) thereof,

Whereas:

- (1) Regulation (EC) No 1221/2009 obliges the Commission to develop sectoral reference documents for specific economic sectors. The documents must include best environmental management practices, environmental performance indicators and, where appropriate, benchmarks of excellence and rating systems identifying environmental performance levels. Organisations registered or preparing to become registered under the eco-management and audit scheme established by Regulation (EC) No 1221/2009 are required to take those documents into account when developing their environmental management system and when assessing their environmental performance in their environmental statement, or updated environmental statement, prepared in accordance with Annex IV to that Regulation.
- (2) Regulation (EC) No 1221/2009 required the Commission to establish a working plan setting out an indicative list of sectors to be considered priority sectors for the adoption of sectoral and cross-sectoral reference documents. 'Communication from the Commission — Establishment of the working plan setting out an indicative list of sectors for the adoption of sectoral and cross-sectoral reference documents, under Regulation (EC) No 1221/2009 on the voluntary participation of organisations in a Community eco-management and audit scheme (EMAS)' ⁽²⁾ identified the electrical and electronic equipment manufacturing sector as a priority sector.
- (3) The sectoral reference document for the electrical and electronic equipment manufacturing sector should focus on best practices, indicators and benchmarks for manufacturers of electrical and electronic equipment. It should identify, by way of best environmental management practices for the sector, concrete actions to improve the overall environmental management of companies in the sector in three main areas: manufacturing processes, supply chain management and actions fostering a more circular economy.
- (4) In order to allow organisations, environmental verifiers and others sufficient time to prepare for introduction of the sectoral reference document for the electrical and electronic equipment manufacturing sector, the date of application of this Decision should be deferred by a period of 120 days from the date of its publication in the *Official Journal of the European Union*.
- (5) In developing the sectoral reference document annexed to this Decision, the Commission has consulted with Member States and other stakeholders in accordance with Regulation (EC) No 1221/2009.
- (6) The measures provided for in this Decision are in accordance with the opinion of the Committee established by Article 49 of Regulation (EC) No 1221/2009,

⁽¹⁾ OJ L 342, 22.12.2009, p. 1.

⁽²⁾ OJ C 358, 8.12.2011, p. 2.

HAS ADOPTED THIS DECISION:

Article 1

The sectoral reference document on best environmental management practices, sector environmental performance indicators and benchmarks of excellence for the electrical and electronic equipment manufacturing sector for the purposes of Regulation (EC) No 1221/2009 is set out in the Annex to this Decision.

Article 2

This Decision shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

It shall apply from 19 May 2019.

Done at Brussels, 19 December 2018.

For the Commission

The President

Jean-Claude JUNCKER

ANNEX

1. INTRODUCTION

This Sectoral Reference Document (SRD) is based on a detailed scientific and policy report⁽¹⁾ ('Best Practice Report') developed by the European Commission's Joint Research Centre (JRC).

Relevant legal background

The Community eco-management and audit scheme (EMAS) was introduced in 1993, for voluntary participation by organisations, by Council Regulation (EEC) No 1836/93⁽²⁾. Subsequently, EMAS has undergone two major revisions:

- Regulation (EC) No 761/2001 of the European Parliament and of the Council⁽³⁾,
- Regulation (EC) No 1221/2009.

An important new element of the latest revision, which came into force on 11 January 2010, is Article 46 on the development of SRDs. The SRDs have to include best environmental management practices (BEMPs), environmental performance indicators for the specific sectors and, where appropriate, benchmarks of excellence and rating systems identifying performance levels.

How to understand and use this document

The eco-management and audit scheme (EMAS) is a scheme for voluntary participation by organisations committed to continuous environmental improvement. Within this framework, this SRD provides sector-specific guidance to the electrical and electronic equipment manufacturing sector and points out a number of options for improvement as well as best practices.

The document was written by the European Commission using input from stakeholders. A Technical Working Group, comprising experts and stakeholders of the sector, led by the JRC, discussed and ultimately agreed on the best environmental management practices, sector-specific environmental performance indicators and benchmarks of excellence described in this document; these benchmarks in particular were deemed to be representative of the levels of environmental performance that are achieved by the best performing organisations in the sector.

The SRD aims to help and support all organisations that intend to improve their environmental performance by providing ideas and inspiration as well as practical and technical guidance.

The SRD is primarily addressed to organisations that are already registered with EMAS; secondly to organisations that are considering registering with EMAS in the future; and thirdly to all organisations that wish to learn more about best environmental management practices in order to improve their environmental performance. Consequently, the objective of this document is to support all organisations in the electrical and electronic equipment manufacturing sector to focus on relevant environmental aspects, both direct and indirect, and to find information on best environmental management practices, as well as appropriate sector-specific environmental performance indicators to measure their environmental performance, and benchmarks of excellence.

How SRDs should be taken into account by EMAS-registered organisations

Pursuant to Regulation (EC) No 1221/2009, EMAS-registered organisations are to take SRDs into account at two different levels:

1. When developing and implementing their environmental management system in light of the environmental reviews (Article 4(1)(b)):

⁽¹⁾ The scientific and policy report is publicly available on the JRC website at the following address: http://susproc.jrc.ec.europa.eu/activities/emas/documents/BEMP_EEE_Manufacturing.pdf The conclusions on best environmental management practices and their applicability as well as the identified specific environmental performance indicators and the benchmarks of excellence contained in this Sectoral Reference Document are based on the findings documented in the scientific and policy report. All the background information and technical details can be found there.

⁽²⁾ Council Regulation (EEC) No 1836/93 of 29 June 1993 allowing voluntary participation by companies in the industrial sector in a Community eco-management and audit scheme (OJ L 168, 10.7.1993, p. 1).

⁽³⁾ Regulation (EC) No 761/2001 of the European Parliament and of the Council of 19 March 2001 allowing voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) (OJ L 114, 24.4.2001, p. 1).

Organisations should use relevant elements of the SRD when defining and reviewing their environmental targets and objectives in accordance with the relevant environmental aspects identified in the environmental review and policy, as well as when deciding on the actions to implement to improve their environmental performance.

2. When preparing the environmental statement (*Article 4(1)(d) and Article 4(4)*):

- (a) Organisations should consider the relevant sector-specific environmental performance indicators in the SRD when choosing the indicators ⁽⁴⁾ to use for their reporting of environmental performance.

When choosing the set of indicators for reporting, they should take into account the indicators proposed in the corresponding SRD and their relevance with regards to the significant environmental aspects identified by the organisation in its environmental review. Indicators need only be taken into account where relevant to those environmental aspects that are judged as being most significant in the environmental review.

- (b) When reporting on environmental performance and on other factors regarding environmental performance, organisations should mention in the environmental statement how the relevant best environmental management practices and, if available, benchmarks of excellence have been taken into account.

They should describe how relevant best environmental management practices and benchmarks of excellence (which provide an indication of the environmental performance level that is achieved by best performers) were used to identify measures and actions, and possibly to set priorities, to (further) improve their environmental performance. However, implementing best environmental management practices or meeting the identified benchmarks of excellence is not mandatory, because the voluntary character of EMAS leaves the assessment of the feasibility of the benchmarks and of the implementation of the best practices, in terms of costs and benefits, to the organisations themselves.

Similarly to environmental performance indicators, the relevance and applicability of the best environmental management practices and benchmarks of excellence should be assessed by the organisation according to the significant environmental aspects identified by the organisation in its environmental review, as well as technical and financial aspects.

Elements of SRDs (indicators, BEMPs or benchmarks of excellence) not considered relevant with regards to the significant environmental aspects identified by the organisation in its environmental review should not be reported or described in the environmental statement.

EMAS participation is an ongoing process. Every time an organisation plans to improve its environmental performance (and reviews its environmental performance) it shall consult the SRD on specific topics to find inspiration about which issues to tackle next in a step-wise approach.

EMAS environmental verifiers shall check if and how the SRD was taken into account by the organisation when preparing its environmental statement (Article 18(5)(d) of Regulation (EC) No 1221/2009).

When undertaking an audit, accredited environmental verifiers will need evidence from the organisation of how the relevant elements of the SRD have been selected in light of the environmental review and taken into account. They shall not check compliance with the described benchmarks of excellence, but they shall verify evidence on how the SRD was used as a guide to identify indicators and proper voluntary measures that the organisation can implement to improve its environmental performance.

⁽⁴⁾ According to Annex IV (B.e.) of the EMAS Regulation, the environmental statement shall contain 'a summary of the data available on the performance of the organisation against its environmental objectives and targets with respect to its significant environmental impacts. Reporting shall be on the core indicators and on *other relevant existing environmental performance indicators* as set out in Section C'. Annex IV — Section C states that 'each organisation shall also report annually on its performance relating to the more specific environmental aspects as identified in its environmental statement and, where available, take account of sectoral reference documents as referred to in Article 46.'

Given the voluntary nature of EMAS and SRD, no disproportionate burdens should be put on the organisations to provide such evidence. In particular, verifiers shall not require an individual justification for each of the best practices, sector-specific environmental performance indicators and benchmarks of excellence which are mentioned in the SRD and not considered relevant by the organisation in light of its environmental review. Nevertheless, they could suggest relevant additional elements for the organisation to take into account in the future as further evidence of its commitment to continuous performance improvement.

Structure of the Sectoral Reference Document

This document consists of four chapters. Chapter 1 introduces EMAS' legal background and describes how to use this document, while Chapter 2 defines the scope of this SRD. Chapter 3 briefly describes the different best environmental management practices (BEMPs) ⁽⁵⁾ together with information on their applicability. When specific environmental performance indicators and benchmarks of excellence could be formulated for a particular BEMP, these are also given. However, defining benchmarks of excellence was not possible for all BEMPs either because of the limited availability of data or because the specific conditions of each company and/or plant (type of electrical and electronic equipment manufactured ranging from large household appliances to small and microelectronic equipment and including both business-to-business and business-to-consumers, diversity of manufacturing processes carried out in each manufacturing facility, etc.) vary to such an extent that a benchmark of excellence would not be meaningful. Even when benchmarks of excellence are given, these are not meant as targets for all companies to reach or metrics to compare the environmental performance across companies of the sector, but rather as a measure of what is possible to help individual companies assess the progress they made and motivate them to improve further. Finally, Chapter 4 presents a comprehensive table with a selection of the most relevant environmental performance indicators, associated explanations and related benchmarks of excellence.

2. SCOPE

This reference document addresses the environmental performance of the Electrical and Electronic Equipment (EEE) manufacturing sector. The target group of this document are companies belonging to the EEE manufacturing sector, i.e. to the following NACE codes (according to the statistical classification of economic activities established by Regulation (EC) No 1893/2006 ⁽⁶⁾):

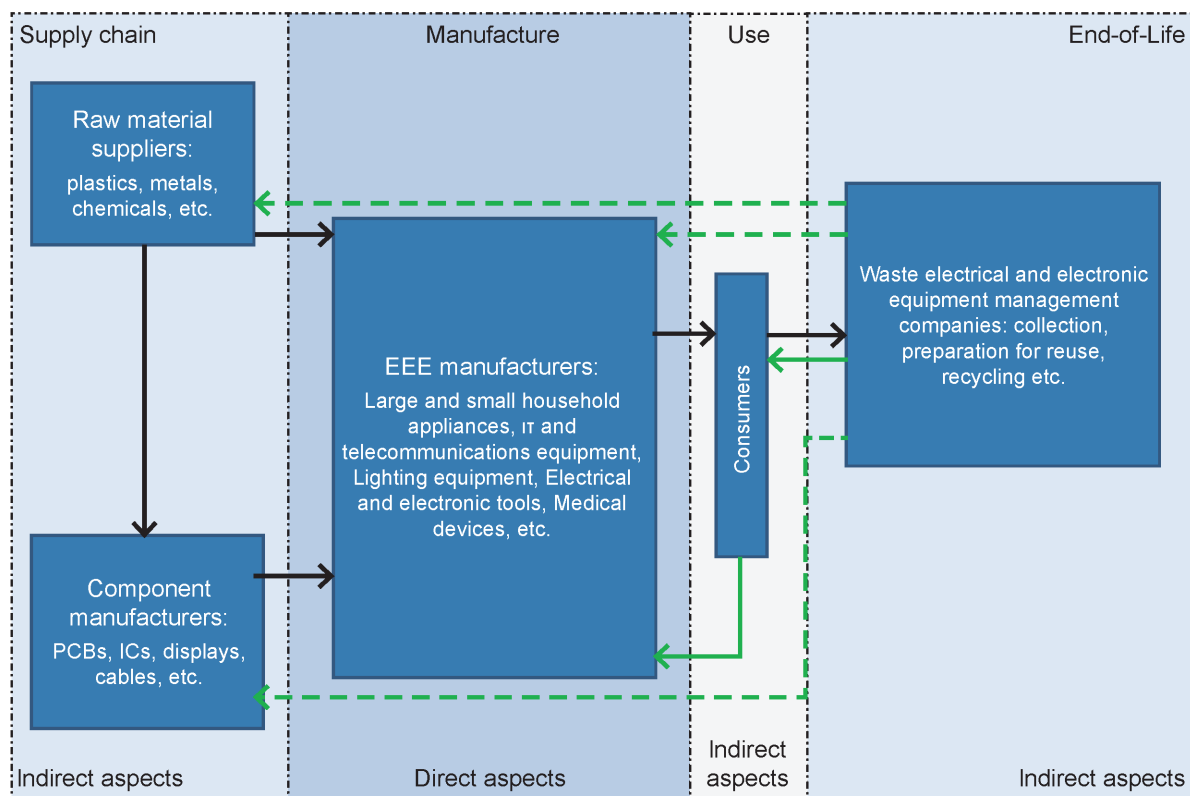
- 26 — Manufacture of computer, electronic and optical products,
- 27 — Manufacture of electrical equipment,
- 28.12, 28.13 — Manufacture of fluid power equipment and of other pumps and compressors,
- 28.22 — Manufacture of lifting and handling equipment,
- 28.23 — Manufacture of office machinery and equipment.

This reference document covers actions that EEE manufacturers can implement to achieve improvements in the environmental performance over the whole EEE value chain, as presented in the figure below. In the figure, the arrows show the key material flows among the different actors in the value chain, while the terms 'direct' and 'indirect' are used to distinguish the activities where a manufacturer has full control ('direct environmental aspects') to those resulting from the interaction with third parties but which can be influenced to a reasonable degree by the EEE manufacturer ('indirect environmental aspects').

⁽⁵⁾ A detailed description of each of the best practices, with practical guidance on how to implement them, is available in the 'Best Practice Report' published by the JRC and available on-line at: http://susproc.jrc.ec.europa.eu/activities/emas/documents/BEMP_EEE_Manufacturing.pdf Organisations are invited to consult it if interested in learning more about some of the best practices described in this SRD.

⁽⁶⁾ Regulation (EC) No 1893/2006 of the European Parliament and of the Council of 20 December 2006 establishing the statistical classification of economic activities NACE Revision 2 and amending Council Regulation (EEC) No 3037/90 as well as certain EC Regulations on specific statistical domains (OJ L 393, 30.12.2006, p. 1).

Overview of key material flows of the electrical and electronic equipment (EEE) manufacturing value chain



This reference document is divided into three main sections (Table 2-1) which cover, from the perspective of the manufacturers, the main environmental aspects along the value chain of the electrical and electronic equipment.

Table 2-1

Structure of the reference document for the electrical and electronic equipment manufacturing sector and main environmental aspects addressed

Section	Description	Main environmental aspects addressed
3.1. BEMPs for manufacturing processes	This section covers the activities related to core electrical and electronic equipment manufacturing operations.	Component manufacturing and assembly Final product assembly Plant utilities Site management
3.2. BEMPs for supply chain management	This section deals with the management of the supply chain by electrical and electronic equipment manufacturers. It focuses on the operations that companies in the sector can put in place to sustainably source materials, substitute hazardous substances and reduce the biodiversity impacts of their supply chain.	Sourcing of materials and components Communication with and management of suppliers Product design

Section	Description	Main environmental aspects addressed
3.3. BEMPs fostering a more circular economy	This section deals with management and strategic practices that electrical and electronic equipment manufacturers can implement to foster a more circular economy, such as changing design practices, remanufacturing products, or developing more sustainable business models.	Product design/Development of business models End-of-life management

The environmental aspects presented in Table 2-2 were selected as the most commonly relevant in the sector. However, the environmental aspects to be managed by specific companies need to be assessed on a case-by-case basis.

Table 2-2

Most relevant environmental aspects and related main environmental pressures addressed in this document

Most relevant environmental aspects	Related main environmental pressures
Component manufacturing and assembly	Resource efficiency Water Waste Emissions to air Soil Energy and climate change Hazardous substances Biodiversity
Final product assembly	Energy and climate change
Plant utilities	Resource efficiency Water Waste Emissions to air Energy and climate change Biodiversity
Site management	Water Waste Emissions to air Soil Energy and climate change Biodiversity
Sourcing of materials and components	Resource efficiency Energy and climate change Biodiversity

Most relevant environmental aspects	Related main environmental pressures
Communication with and management of suppliers	Resource efficiency Energy and climate change Hazardous substances
Product design/Development of business model	Resource efficiency Water Waste Emissions to air Energy and climate change Hazardous substances
End-of-life management	Resource efficiency Waste

3. BEST ENVIRONMENTAL MANAGEMENT PRACTICES, SECTOR ENVIRONMENTAL PERFORMANCE INDICATORS AND BENCHMARKS OF EXCELLENCE FOR THE ELECTRICAL AND ELECTRONIC EQUIPMENT MANUFACTURING SECTOR

3.1. BEMPs for manufacturing processes

This section is relevant for the EEE manufacturers.

3.1.1. *Energy-efficient cleanroom technology*

BEMP is to minimise the energy use of the cleanrooms. This can be achieved by implementing the following measures:

- Defining the capacity of the cleanroom facility correctly and dimensioning its equipment accordingly. Downsizing to the minimum required is the target for all equipment, except cooling towers and passive components (pipes and ducts) which can be upsized to save energy. Their upsizing improves the chiller performance and allows the use of smaller fans and pumps.
- Reducing the pressure difference between the cleanroom and its surroundings and adapting the air volume to the demand in order to reduce the electricity use of the fans.
- Allowing wider operating ranges for the cleanroom space temperature and relative humidity. Wider operating ranges lead to lower energy use for cooling, preheating and dehumidification of the supply airflow.
- Setting a lower face velocity ⁽⁷⁾ by combining larger air handling units with smaller fans that allow the air circulation to be maintained at a lower velocity.
- Determining the lowest possible Air Change Rate (ACR) by reducing the heat load and the actual particle generation within the cleanroom.
- Exploiting all opportunities to reduce the heat load generated within the cleanroom and recover the waste heat from process equipment. The recovered waste heat can be used, for instance, to reheat supply air.
- Using highly efficient components, such as Variable-Frequency Drive (VFD) fan motors, pumps and chillers to allow a better response to the varying load of the cleanroom.

⁽⁷⁾ Face velocity is the speed at which air passes over the filters or heating/cooling coils in an air handler unit.

- Avoiding over-purification of the water required for the cleanroom operations by respecting the specifications of the required cleanroom classification, without excessively large safety margins.

Applicability

The BEMP is broadly applicable to all EEE manufacturers that operate cleanrooms.

For newly built cleanroom facilities, the ACR can be lower than the ACR range recommended according to its classification, but efforts are necessary to ensure and adjust the quality requirements of the cleanroom. For existing cleanroom facilities, particle count-based control and continuous monitoring can be applied to reduce ACR values.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i1) Energy use in the cleanroom for printed circuit board manufacturing (kWh/m ² of processed printed circuit board) (i2) Energy use in the cleanroom for semiconductors and/or integrated circuits manufacturing (kWh/cm ² of silicon wafers) (i3) Air Change Rate (number/hour) (i4) COP (Coefficient of Performance) of the cooling equipment installed (kWh cooling energy produced/kWh energy used) (i5) Water conductivity (µS/cm)	N/A

3.1.2. Energy-efficient cooling technology

BEMP is to reduce the need for cooling and improve the energy efficiency of the cooling systems used in production processes and production halls. This can be achieved by applying the following measures:

- Assessing and optimising the required temperature level for each of the processes and rooms/spaces with a cooling demand.
- Using cooling cascades by splitting the existing cooling circuit into two or more temperature levels.
- Implementing free cooling techniques. Different relevant technological options include direct cooling with flow-through colder outside air, free dry cooling where a water cycle is cooled with outside air and free wet cooling (cooling tower).
- Using a heat recovery ventilation system to cool and dehumidify the incoming ambient air.
- Using absorption cooling technology as an alternative to compression chillers. Recovered waste heat can be used to provide the thermal compression of the refrigerant.

Applicability

Measures to improve the energy efficiency of cooling are broadly applicable to EEE manufacturing companies.

To be able to implement free cooling, the temperature level of the return flow of the cooling system must be above the outdoor temperature and enough space must be available in the outdoor area of the production site.

Absorption cooling is applicable where a source of waste heat or renewable heat is continuously available at the production site or in its surroundings.

The economic feasibility of the proposed measures depends substantially on the existence of a year-round cooling load.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i6) Coefficient of Performance (COP) for individual cooling equipment (kW of cooling power provided/kW of power used)	N/A
(i7) Coefficient of System Performance (COSP) including the energy required to run the supplementary equipment of the cooling system, e.g. pumps (kW of cooling power provided/kW of power used)	
(i8) Use of cooling cascades (Y/N)	
(i9) Use of free cooling (Y/N)	
(i10) Use of heat recovery ventilators (Y/N)	
(i11) Use of absorption chillers (Y/N)	
(i12) Energy use of the cooling system per unit of turnover (kWh/EUR)	

3.1.3. Energy-efficient soldering

BEMP is to improve the energy efficiency of reflow soldering operations.

For existing soldering equipment, BEMP is to do the following:

- Maximise the throughput of the existing reflow soldering equipment in order to reduce the specific electricity demand per square metre of manufactured printed circuit boards. This is achieved through the optimisation of the speed of the conveyor of the soldering line while maintaining an acceptable process window.
- Install retrofit insulation to the soldering equipment.

For new soldering equipment, BEMP is to do the following:

- Select equipment with (i) an improved power management system (e.g. available standby or dormant state); (ii) a flexible cooling system which allows switching between an internal and external cooling unit and enables waste heat recovery; and (iii) an improved consumption monitoring and control system for liquid nitrogen.
- Use of direct-current (DC) fan motors instead of alternating-current (AC) in order to regulate the speed of the different motors separately.

For both existing systems and new soldering equipment, BEMP is to:

- avoid the use of liquid nitrogen for less delicate applications, such as low-complexity assemblies.

Applicability

This BEMP is applicable to EEE manufacturers with reflow soldering operations, and especially relevant for the production of printed circuit boards (PCB).

The measures for new soldering equipment are applicable when the decision is taken to install a new reflow soldering line. The return on investment depends considerably on increased yield, performance, and maintenance requirements rather than energy savings.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i13) Total energy demand per surface unit of printed circuit board processed (kWh of electricity/m ² of PCB)	N/A
(i14) Nitrogen consumption per surface unit of printed circuit board processed (kg of nitrogen/m ² of PCB)	

3.1.4. On-site copper recycling in process chemicals

BEMP is to recover copper from the etching process agents used in printed circuit board manufacturing by electrolysis. This allows the recovery of high-quality copper, the reduction of the amount of etching agent used and the reuse of water.

Applicability

The BEMP is applicable to printed circuit board production facilities. However, the economic feasibility depends greatly on the production levels, and thus on the amount of high-quality copper that can be recovered (e.g. over 60 t of copper per year). A further limitation is the space needed for the on-site recycling system, which ranges between 50 m² and 80 m² depending on the arrangement of the installation and the volume of the buffer tanks. However, this does not necessarily need to be right next to the etching process.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i15) On-site copper recycling system in place (Y/N)	N/A
(i16) Amount of copper recycled from etching process agents (t/year)	

3.1.5. Cascade rinsing systems

BEMP is to minimise water use in EEE printed circuit board (PCB) manufacturing companies by installing multiple cascade rinsing systems with four or more stages.

In addition, BEMP is optimising water use, e.g. by setting the water intake in rinsing baths according to process-specific quality requirements and by reuse of rinsing bath water for different process steps.

Applicability

The BEMP is broadly applicable to printed circuit board manufacturing companies. The optimisation measures and the installation of multiple cascade rinsing systems with at least four stages are applicable both in existing facilities and in new builds. In the case of cascade rinsing systems with four or more stages, the available space may pose some limitations.

Five-stage cascade rinsing systems specifically are most applicable for systems with a high machine throughput or highly concentrated electrolytes and the following additional limiting factors need to be considered:

- highly concentrated rinse water leads to a greater use of chemicals and more time being needed for sedimentation in deionisation for waste water treatment,

- heating of the rinsing bath water due to increased numbers of pumps, which increases pressure by germ contamination,
- germ contamination needs to be mitigated by implementing proper water disinfection techniques.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i17) Total water consumption in the fabrication plant (l/m ² of PCB manufactured) (i18) Share of cascade rinsing systems with four or five stages out of the total number of rinsing facilities (%) (i19) Water consumption in cascade rinsing systems with four or five stages compared with the water consumption in three-stage cascade rinsing systems (%) (i20) Five-stage cascade rinsing system in place (Y/N)	(b1) At least 50 % of the rinsing facilities are equipped with a cascade rinsing system with four or more stages

3.1.6. Minimisation of perfluorocompound emissions

BEMP is to minimise the emissions of perfluorocompounds (PFC) in semiconductor fabrication facilities by the following measures:

- Substituting PFC gases with a high specific global warming potential with others with a lower global warming potential, e.g. replacement of C₂F₆ by C₃F₈ for Chemical Vapour Deposition (CVD) chamber cleaning.
- Optimising the CVD chamber cleaning process to increase the conversion factor of the PFC gases used, in order to avoid unused PFC gases being emitted after the chamber cleaning process. This requires the monitoring of emissions and the adjustment of operational parameters, such as chamber pressure and temperature, plasma power, cleaning gas flow rates and gas ratios in the event that PFC gas mixtures are used.
- Operating remote plasma cleaning technology that replaces the use of PFC gases in situ (e.g. C₂F₆ and CF₄) with remote NF₃. In this process, NF₃ is dissociated by the plasma before entering the process chamber and is thus used more efficiently with very little NF₃ being emitted from the process chamber after cleaning.
- Installing point-of-use (POU) abatement techniques, such as: a burner-scrubber, installed after the vacuum pump, or a small plasma source, installed before the vacuum pump, used to abate PFC emissions from plasma etching.

Applicability

The BEMP is broadly applicable to semiconductor fabrication facilities using PFC gases. However, the specific measures that can be implemented in a facility need to be assessed on a case-by-case basis.

Process optimisation is broadly applicable and can be an effective measure both in existing facilities and in new-build CVD chambers. It is the only measure which also saves costs, since it can allow lower gas consumption and better throughput.

Substitution of PFC gases is often technically unfeasible, especially for plasma etching.

Remote plasma cleaning technology using NF_3 is broadly applicable to fabrication facilities. However, its implementation may require replacing processing equipment. It is thus more feasible when a new production facility is being built or obsolete processing equipment needs to be renewed.

Concerning point-of-use abatement techniques, burner-scrubber systems are more common than point-of-use plasma abatement. The limitations to the applicability of scrubber systems are space, existing infrastructure and costs. For the plasma abatement devices, one of the main limitations is their low flow treatment capacity.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i21) Normalised Emission Rate for perfluorocompounds emissions ($\text{kg CO}_2\text{eq}/\text{cm}^2$) (i22) Minimisation of PFC emissions by applying one of the following techniques (Y/N): — substitution of PFC gases with a high specific global warming potential with others with lower global warming potential — application of process optimisation focused on CVD chamber cleaning — installation of remote plasma cleaning technology — use of POU abatement techniques	(b2) The Normalised Emission Rate for PFC emissions in new-build semiconductor fabrication facilities or facilities having undergone major renovation is lower than $0,22 \text{ kg CO}_2\text{eq}/\text{cm}^2$

3.1.7. Rational and efficient use of compressed air

BEMP is for electrical and electronic equipment manufacturers to reduce their energy consumption associated with the use of compressed air in the manufacturing processes by the following measures:

- Mapping and assessing the use of compressed air. When part of the compressed air is used in inefficient applications or in an inappropriate manner, other technological solutions may be more fit for purpose or more efficient. In case a switch from pneumatic tools to electricity-driven tools for a certain application is considered, a proper assessment, considering not just energy consumption but all environmental aspects as well as the specific needs of the application, needs to be carried out.
- Optimising the compressed air system by:
 - identifying and eliminating leaks, using suitable control technology, such as ultrasound measuring instruments for air leaks that are hidden or difficult to access,
 - better matching of the supply and demand of compressed air within the manufacturing facility, i.e. matching the air pressure, volume and quality to the needs of the various end-use devices and, when appropriate, producing the compressed air closer to the consumption centres by choosing decentralised units rather than a large centralised compressor catering for all uses,
 - producing the compressed air at a lower pressure by decreasing the pressure losses in the distribution network and, when needed, adding pressure boosters only for devices that require higher pressure than most applications,
 - designing the compressed air system based on the annual load duration curve, in order to ensure supply with the minimum energy use over base, peak and minimal loads,

- selecting highly efficient components for the compressed air system, such as highly efficient compressors, variable-frequency drives and air dryers with integrated cold storage,
- once all of the above is optimised, recovering the heat from the compressor(s) through the installation of a plate heat exchanger within the oil circuit of the compressors; the recovered heat can be employed in a variety of applications, such as the drying of products, regeneration of the desiccant dryer, space heating, cooling thanks to the operation of an absorption chiller or converting the recovered heat into mechanical energy using Organic Rankine Cycle (ORC) machines.

Applicability

The measures described in this BEMP are broadly applicable to all EEE companies that use compressed air.

Regarding the heat recovery, a continuous demand for process heat is necessary in order to realise the corresponding energy and cost savings.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i23) Electricity use of the compressed air system per unit of volume at the point of end use (kWh/m ³)	(b3) The electricity use of the compressed air system is lower than 0,11 kWh/m ³ of compressed air delivered, for large installations operating at a gauge pressure of 6,5 bar, with volume flow normalised at 1 013 mbar and 20 °C, and pressure deviations not exceeding 0,2 bar.
(i24) Air Leakage Index ⁽¹⁾ (No)	(b4) After all air consumers are switched off, the network pressure remains stable and the compressors (on standby) do not switch to load condition.

⁽¹⁾ The Air Leakage Index is calculated, when all air consumers are switched off, as the sum for each of the compressors of the time it runs multiplied by the capacity of that compressor, divided by the total standby time and the total rated capacity of the compressors in the system

$$\text{Air Leakage Index} = \frac{\sum_i t_{i(cr)} * C_{i(cr)}}{t_{(sb)} * C_{(tot)}}$$

3.1.8. Protection and enhancement of biodiversity

BEMP is to devise, implement and periodically review an action plan for protecting and enhancing biodiversity at the production facilities and in nearby areas. Examples of actions that can be included in the action plan are:

- planting trees or reintroducing native species into a degraded natural environment,
- surveying flora and fauna, with the aim of documenting and monitoring the state of biodiversity at a specific site,
- allowing open land within a facility to 'revert to nature',
- developing biotopes to create new habitats,
- involving staff, their relatives and local communities in biodiversity projects.

Applicability

The BEMP is broadly applicable to all electrical and electronic equipment manufacturers.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i25) Land use — area of land within the production site and its assessed natural value (e.g. brown fields, areas adjacent to protected areas, areas of high biodiversity value) (m ²) (i26) Area of protected or restored natural habitats within the production site, or outside but managed or protected by the manufacturer (m ²) (i27) Implementation of a site biodiversity action plan in all production facilities (Y/N)	(b5) A biodiversity action plan is implemented in all production facilities to protect and enhance the state of biodiversity (flora and fauna) at the specific site

3.1.9. *Use of renewable energy*

BEMP is for electrical and electronic equipment manufacturing companies to use renewable energy for their processes thanks to:

- purchase of verified additional renewable electricity or own generation of electricity from renewable energy sources,
- own production of heat from renewable energy sources.

Applicability

This BEMP is broadly applicable to all companies in the sector.

Use of renewable electricity (self-generated or purchased) is possible in all cases.

Integration of heat from renewable sources in EEE manufacturing processes is, in contrast, more difficult due to their complexity, the need for high temperatures, and, in some cases, incompatibility between the heat demand and the seasonality of the renewable heat offer.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i28) Share of electricity from renewable sources (self-generated or purchased with verified additionality) out of the total electricity use (%) (i29) Share of heat from renewable sources out of the total heat use (%)	N/A

3.1.10. *Optimised waste management within manufacturing facilities*

BEMP is for electrical and electronic equipment manufacturers to develop and implement a waste management strategy that prioritises other treatment options besides disposal for all the waste generated at the manufacturing facilities and follows the waste hierarchy⁽⁸⁾. This strategy needs to encompass both non-hazardous and hazardous waste fractions, set ambitious targets for improvement and monitor them, and also explore possibilities to implement the approach of industrial symbiosis.

⁽⁸⁾ Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives (OJ L 312, 22.11.2008, p. 3), known as the Waste Framework Directive, introduces an order of preference for action to reduce and manage waste. This is known as the waste hierarchy. It set the highest priority on waste prevention, followed by waste reuse, then recycling and then (energy) recovery of waste fractions that cannot be prevented, reused or recycled. Finally, waste disposal is only to be considered when none of the previous routes are possible.

Applicability

This BEMP is broadly applicable to all EEE manufacturing companies.

A limiting factor for the effective implementation of industrial symbiosis is the need for communication and coordination among different companies, i.e. lack of knowledge of and insight into other companies' activities and thus potential exploitation routes for waste and by-products.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i30) Development and implementation of an effective waste management strategy (Y/N)	(b6) The company has a waste management strategy in place in all sites
(i31) Share of sites with a waste management strategy (%)	(b7) The company achieves a waste disposal diversion rate of 93 % on average across all manufacturing plants
(i32) Recycling rate of the waste generated at manufacturing plants (%)	
(i33) Waste disposal diversion rate of the waste generated at manufacturing plants (%)	
(i34) For a specific product or product range, waste generation per metric ton of product or other suitable functional unit (kg/t)	

3.2. BEMPs for supply chain management

This section is relevant for EEE manufacturers and deals with practices related to their supply chain.

3.2.1. Assessment tools for cost-effective and environmentally sound substitution of hazardous substances

BEMP is to use reference tools to identify and assess hazardous substances in purchased materials in order to substitute them. Manufacturers will use input data from suppliers, provided ideally as full material declarations or declarations of conformity, to track substances. The assessment then focusses on three key steps:

- clarification of whether the substance under discussion is a substance of very high concern (based on the REACH Candidate List) or a RoHS restricted substance ⁽⁹⁾, in which case substitution has high priority,
- classification of the substance under discussion taken from the safety data sheet and confirmed by comparison with a database of hazardous substances,
- use of an assessment tool in addition to the above, for specific substances, such as certain phthalates and halogenated flame retardants, to investigate the best alternatives.

Applicability

This BEMP is, in principle, applicable to all companies of the sector. However, SMEs may lack the leverage to demand full material declarations from many suppliers, in which case they can request supplier declarations of conformity complemented by laboratory testing.

⁽⁹⁾ Some of which can still be used by virtue of RoHS exemptions

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i35) Share of suppliers that provide a full material declaration (% of supply chain expenditure) (i36) Share of suppliers that issue a supplier declaration of conformity for a company-specific list of restrictions, complemented by a certification (preferably third-party) based on laboratory testing (% of supply chain expenditure) (i37) Disclosure (e.g. on website and in annual sustainability reports) of the two previous indicators (Y/N)	(b8) Mandatory requirements for all major suppliers (in terms of % of supply chain expenditure) to provide a full material declaration are in place

3.2.2. Disclosure and setting of targets for supply chain greenhouse gases emissions

BEMP is to assess, according to recognised standards, and regularly disclose all the direct and the most relevant indirect greenhouse gas (GHG) emissions (all scope 1 and scope 2 as well as the most relevant scope 3 emissions ⁽¹⁰⁾). Based on the assessment, BEMP is to set targets for the reduction of those direct and indirect GHG emissions as well as to demonstrate and regularly publish actual absolute and/or relative GHG emission reductions.

Applicability

This BEMP is applicable to all companies of the sector. However, there are some limitations in the calculation of scope 3 emissions, due to the complexity of the value chains of EEE.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i38) Periodical (e.g. annual) publication of GHG emissions calculated with a recognised standard method (Y/N) (i39) Categories of scope 3 emissions included in the assessment (i40) Periodical (e.g. annual) disclosure of demonstrated actual absolute and/or relative GHG emission reductions (Y/N)	(b9) GHG emissions (including scope 1, 2 and the most relevant scope 3) are calculated with a recognised standard method and periodically published (b10) Absolute or relative GHG emission reduction targets are disclosed publicly (b11) Absolute and/or relative actual GHG emission reductions are demonstrated and periodically published

⁽¹⁰⁾ According to the GHG Protocol, scope 1 emissions are all the direct GHG emissions of a company, i.e. GHG emissions that are released by owned or controlled facilities or vehicles. Scope 2 emissions are indirect GHG emissions from consumption of purchased electricity, heat, cold or steam, i.e. emissions that were released elsewhere to produce the energy consumed within company boundaries. Scope 3 denotes all other indirect emissions from product (good or service) or material flows entering or leaving the company boundaries.

3.2.3. Application of Life Cycle Assessment

BEMP is to make use of Life Cycle Assessments (LCA) as a decision support instrument in the context of: strategic planning (macro-level), design and planning of products, facilities, and processes (micro-level) and monitoring the environmental performance of the company (accounting). Conducting LCA on product ranges to support environmental improvements is the most relevant area of application in the industry and allows the setting of LCA-based improvement targets for product ranges.

Applicability

This BEMP is broadly applicable to all electrical and electronic equipment manufacturing companies, especially to large companies.

Internal resources and the complexity of LCA are potential limiting factors for the conducting of LCA for small and medium-sized enterprises. However, simplified LCA tools and ready-made databases help mitigate the difficulties.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i41) Inclusion of LCA according to the ISO standards 14040 and 14044 in the environmental strategy of the company and use of LCA when taking major decisions for developing new and redesigned products (Y/N)	(b12) LCA is carried out according to the international standards ISO 14040 and ISO 14044
(i42) Percentage of product ranges for which LCA-based improvement targets have been met (weighted by number of product models or by sales)	(b13) The company carries out LCA for new and redesigned products and the results are systematically used as a basis for product development choices

3.2.4. Protection and enhancement of biodiversity along the electrical and electronic equipment supply chain

BEMP is to develop and implement a programme for managing the biodiversity impacts related to supply chain products and supply chain activities.

Based on a mapping of products and materials provided by the supply chain and of their relevant impacts on biodiversity, procurement guidelines and requirements can be formulated, targeting changes in relation to products and components with a greater potential to impact biodiversity.

Applicability

The BEMP is applicable to all electrical and electronic equipment manufacturing companies.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i43) Implementation of a periodic assessment of biodiversity impacts of products and materials provided by the supply chain (Y/N) (i44) Formulation of procurement guidelines and requirements for the most relevant products and materials identified in the biodiversity assessment (Y/N) (i45) For each of the groups of products (e.g. wood and paper products) for which procurement requirements have been developed by the company: — share of products qualifying as priority procurement (%) — share of products qualifying as acceptable procurement (%) — share of products qualifying as procurement to be avoided (%) (i46) The share (by purchase volume) of suppliers that have provided initial reporting as to their potential impacts on biodiversity (%) (i47) The share (by purchase volume) of suppliers that have developed a biodiversity management plan (%) (i48) The share (by purchase volume) of suppliers that are implementing their biodiversity management plan (i.e. making progress towards achieving set targets) (%)	(b14) The company implements a programme for a periodic assessment of biodiversity impacts of products and materials provided by the supply chain and the results of the assessment are used to formulate procurement guidelines and requirements on the most relevant products and materials.

3.3. BEMPs fostering a more circular economy

This section is relevant for electrical and electronic equipment manufacturing companies and deals with management and strategic practices that foster a more circular economy.

3.3.1. Strategic guidance on designing products for the circular economy

BEMP is to have an approach in place that ensures that the consideration of all the different environmental aspects, and specifically a move towards the circular economy, is systematically integrated into the design process of products. Such an approach is based on:

- setting goals for the improvement of the environmental performance of the products, either at the company level (general goals for all products) or at the level of a specific product; objectives need to be clear, well defined and communicated at the company level so that there is an awareness of employees at all levels; circular economy related goals can be set, depending on the product, on durability, reparability, upgradability and recyclability, which are all largely dictated by design,
- integrating into the design process inputs and feedback from the different units tied to the product manufacture, use and end-of-life, as well as, in some cases, from external stakeholders,
- creating a feeling of a collective effort throughout the company towards the development of the various design specifications for the new products.

This is implemented by one or both of the following approaches:

- setting an internal environmental standard for the design of new products at the company level, with defined general goals and compulsory requirements, which are continuously enhanced based on feedback from different units within the organisation; when starting the design of each specific product, these are then converted into design specifications for the specific product,
- establishing an interdisciplinary design committee or steering group for the design of each product, involving representatives from all the different relevant units directly tied to the various stages in the actual product design process.

Applicability

The BEMP is applicable to all electrical and electronic equipment manufacturing companies

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i49) Setting of circular economy objectives for new products (Y/N) (i50) Number of different units across the company having contributed to design processes (No) (i51) Share of products or components (by number or revenue) for which design cycles or redesign cycles have been embarked upon that explicitly address the different approaches of circular economy (%) (i52) Environmental benefits achieved over their whole life cycle by the products sold during the year that were designed or redesigned taking into account circular economy objectives (kgCO _{2e} for carbon emissions, kg material saved for resource efficiency, etc.)	(b15) The company has put in place circular economy objectives for new products and an effective product design process to ensure these are achieved

3.3.2. Integrated product service offering

BEMP is for EEE manufacturers to provide Integrated Product Service Offerings (IPSO) both in business to businesses and business to consumers, shifting from designing and selling physical products to providing a product service system that leads to an improved functional and environmental performance. For instance, IPSO create incentives for manufacturers to ensure their products are durable or offer the opportunity to take back products to redeploy them or refurbish them for further use.

Applicability

The IPSO model is especially applicable to EEE with a high capital cost and a long useful life.

The applicability in the field of electrical household appliances with limited purchasing costs, a low bill of materials or a significant size/weight is limited (e.g. take-back is not feasible if the economical/technical value is too low compared to transportation costs).

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i53) Implementation of the IPSO model ensuring that it delivers environmental benefits (Y/N)	(b16) The company adopts IPSO in its business ensuring that it leads to a continuous improvement of the environmental performance of the product service offered
(i54) Take-back rates of products installed at customer premises within the IPSO per product category (%)	
(i55) Share of reused devices out of the total number of devices installed within the IPSO (%)	(b17) 100 % take-back rate for post-consumer devices from leasing contracts and 30 % refurbishment rate

3.3.3. *Remanufacturing or high-quality refurbishment of used products*

BEMP is to prevent waste by remanufacturing or refurbishing used electrical and electronic equipment and bringing them into the market for reuse. The remanufactured or refurbished products achieve at least the same quality levels they had when they were first placed on the market and are sold with the appropriate warranty.

Applicability

This practice is particularly suitable for mid- or high-capital-intensive equipment.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i56) Use of LCA to demonstrate that the remanufacturing or refurbishment activities have environmental net benefits, including in light of energy efficiency gains of new product models (Y/N)	(b18) LCA is used to demonstrate that the remanufacturing or refurbishment activities have environmental net benefits, including in light of energy efficiency gains of new product models

3.3.4. *Increase of the content of recycled plastics in electrical and electronic equipment*

BEMP is to increase the use of recycled plastics for the manufacture of electrical and electronic equipment, where applicable according to the required material properties. This can be achieved by closed-loop recycling of plastic production scrap, closed-loop recycling of post-consumer plastics from own products as well as purchasing recycled plastics made from post-consumer plastic waste (open-loop recycling).

Applicability

This BEMP is suitable for many polymers that are used in electrical and electronic equipment manufacturing. Recycled plastics can replace virgin plastics in those cases where the required material specifications can be met.

Associated environmental performance indicators and benchmarks of excellence

Environmental performance indicators	Benchmarks of excellence
(i57) Share of recycled plastics from pre-consumer waste used for the manufacture of a specific product or product group out of the total plastics used for that product or product group (%)	N/A
(i58) Share of recycled plastics from post-consumer waste used for the manufacture of a specific product or product group out of the total plastics used for that product or product group (%)	
(i59) Total amount of recycled plastics from pre-consumer waste used in manufacturing (tonnes)	
(i60) Total amount of recycled plastics from post-consumer waste used in manufacturing (tonnes)	
(i61) Sales of products manufactured with recycled plastics out of total product sales (%)	

4. RECOMMENDED SECTOR-SPECIFIC KEY ENVIRONMENTAL PERFORMANCE INDICATORS

The following table lists a selection of key environmental performance indicators for the electrical and electronic equipment manufacturing sector, together with the related benchmarks and reference to the relevant BEMPs. These are a subset of all the indicators mentioned in Section 3.

Key environmental performance indicators and benchmarks of excellence for the electrical and electronic equipment manufacturing sector

Indicator	Common units	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related BEMP ⁽²⁾
BEMPs for manufacturing processes							
Energy use in the cleanroom for printed circuit board manufacturing	kWh/m ²	Electrical and electronic equipment manufacturers	Energy used in the cleanroom for the manufacturing of printed circuit boards per surface unit of printed circuit board processed	Facility	Energy efficiency	N/A	3.1.1
Energy use in the cleanroom for semiconductors and/or integrated circuits manufacturing	kWh/cm ²	Electrical and electronic equipment manufacturers	Energy used in the cleanroom for the manufacturing of the semiconductors and integrated circuits per surface unit of semiconductors and/or integrated circuits processed	Facility	Energy efficiency	N/A	3.1.1
Air Change Rate (ACR)	Number/hour	Electrical and electronic equipment manufacturers	Frequency of the replacement of the air within the cleanroom	Facility	Energy efficiency	N/A	3.1.1
Coefficient of System Performance (COSP)	kW of cooling power provided/kW of power used	Electrical and electronic equipment manufacturers	Ratio between the useful cooling power provided by a cooling system and the electrical power used by the cooling system. The power used by the supplementary equipment (e.g. pumps) is included in the denominator of this ratio.	Site	Energy efficiency	N/A	3.1.2
Total energy demand per surface unit of printed circuit board processed	kWh/m ² of printed circuit board	Electrical and electronic equipment manufacturers	Amount of energy required for the processing of printed circuit boards divided by the surface of printed circuit boards processed	Facility	Energy efficiency	N/A	3.1.3

Indicator	Common units	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related BEMP ⁽²⁾
Nitrogen consumption per surface unit of printed circuit board processed	kg of nitrogen/m ² of manufactured printed circuit board	Electrical and electronic equipment manufacturers	Amount of nitrogen consumed in the soldering process divided by the total surface of the printed circuit boards manufactured	Facility	Material efficiency	N/A	3.1.3
Amount of copper recycled from etching process agents	t/year	Electrical and electronic equipment manufacturers	Weight of on-site copper recycled from etching process agents over a year	Site	Material efficiency	N/A	3.1.4
Total water consumption in the fabrication plant	l/m ² of manufactured printed circuit board	Electrical and electronic equipment manufacturers	Total volume of water consumed in the fabrication plant divided by the surface of the printed circuit boards manufactured	Site	Water	At least 50 % of the rinsing facilities are equipped with a cascade rinsing system with four or more stages	3.1.5
Normalised Emission Rate for perfluorocompounds emissions	kg CO ₂ eq/cm ²	Electrical and electronic equipment manufacturers	Global warming potential caused by the PFC emissions of a manufacturing site divided by the surface of the wafers produced	Site	Emissions	The Normalised Emission Rate for PFC emissions in new-build semiconductor fabrication facilities or facilities having undergone major renovation is lower than 0,22 kg CO ₂ eq/cm ²	3.1.6

Indicator	Common units	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related BEMP ⁽²⁾
Electricity use of the compressed air system per unit of volume at the point of end use	kWh/m ³	Electrical and electro-mechanic equipment manufacturers	Electricity use of the compressed air system (including the energy use of the compressors, dryers and secondary drives) per standard cubic metre of compressed air delivered, at a stated pressure level	Site	Energy efficiency	The electricity use of the compressed air system is lower than 0,11 kWh/m ³ of delivered compressed air, for large installations working at a gauge pressure of 6,5 bar, with volume flow normalised at 1 013 mbar and 20 °C, and pressure deviations not exceeding 0,2 bar	3.1.7
Air Leakage Index	Number	Electrical and electro-mechanic equipment manufacturers	The Air Leakage Index is calculated when all air consumers are switched off as the sum for each of the compressors of the time it runs multiplied by the capacity of that compressor, divided by the total standby time and the total rated capacity of the compressors in the system, and it is expressed as: $(\text{Air Leakage Index}) = \frac{\sum_i t_{i(cr)} * C_{i(cr)}}{t_{(sb)} * C_{(tot)}}$ where: $t_{i(cr)}$ is the time (min) during which a compressor runs when all air consumers are switched off (standby of the compressed air system); $C_{i(cr)}$ is the capacity (Nl/min) of the compressor that switches on for the time $t_{i(cr)}$ while all air consumers are switched off; $t_{(sb)}$ is the total time (min) during which the installed compressed air equipment is in standby mode; $C_{(tot)}$ is sum of the rated capacity (Nl/min) of all the compressors in the compressed air system.	Site	Energy efficiency	After all air consumers are switched off, the network pressure remains stable and the compressors (on standby) do not switch to load condition	3.1.7

Indicator	Common units	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related BEMP ⁽²⁾
Implementation of a site biodiversity action plan in all production facilities	Y/N	Electrical and electronic equipment manufacturers	This indicator refers to whether all production facilities have in place a biodiversity action plan for the site	Site	Biodiversity	A biodiversity action plan is implemented in all production facilities to protect and enhance the state of biodiversity (flora and fauna) at the specific site	3.1.8
Share of electricity from renewable sources (self-generated or purchased with verified additionality) out of the total electricity use	%	Electrical and electronic equipment manufacturers	Electricity from renewable sources either self-generated or purchased divided by the total electricity use within the site. As per purchased renewable electricity, it is only accounted for in this indicator if verified as additional (i.e. not already accounted for by another organisation or in the electricity mix of the grid).	Site	Energy efficiency	N/A	3.1.9
Share of heat from renewable sources out of the total use of heat	%	Electrical and electronic equipment manufacturers	Heat from renewable sources (e.g. solar thermal, geothermal, biomass) divided by the total use of heat within the site	Site	Energy efficiency	N/A	3.1.9
Waste disposal diversion rate of the waste generated at manufacturing plants	%	Electrical and electronic equipment manufacturers	Weight of waste sent for preparation for reuse, recycling or energy recovery divided by the total amount of waste generated within the manufacturing site. This indicator can be calculated separately for hazardous and for non-hazardous waste and/or for the most important materials of the waste stream, e.g. metal scrap, polymers.	Site	Waste	The company achieves a waste disposal diversion rate of 93 % on average across all manufacturing plants	3.1.10

Indicator	Common units	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related BEMP ⁽²⁾
Share of sites with a waste management strategy	%	Electrical and electronic equipment manufacturers	This indicator is expressed as the number of sites with a waste management strategy in place, based on the elements presented in the description of this BEMP, divided by the total number of sites of the company. In the event that a company has one site only, it can be expressed as a yes/no indicator for the site.	Site	Waste	The company has a waste management strategy in place in all sites	3.1.10

BEMPs for supply chain management

Share of suppliers that provide a full material declaration	%	Electrical and electronic equipment manufacturers	This indicator measures the percentage of supply chain expenditure on suppliers that provide a full material declaration out of the total supply chain expenditure	Site	Biodiversity Material efficiency	Mandatory requirements for all major suppliers (in terms of percentage of supply chain expenditure) to provide a full material declaration are in place	3.2.1
Periodical (e.g. annual) publication of GHG emissions calculated with a recognised standard method	Y/N	Electrical and electronic equipment manufacturers	This indicator refers to whether the GHG emissions of the company (including scope 1 and 2 and the most relevant for scope 3) are calculated according to a recognised standard method and periodically published	Company	Emissions	GHG emissions (including scope 1, 2 and the most relevant scope 3) are calculated with a recognised standard method and periodically published	3.2.2
Periodical (e.g. annual) disclosure of demonstrated actual absolute and/or relative GHG emission reductions	Y/N	Electrical and electronic equipment manufacturers	This indicator refers to the periodical disclosure of demonstrated actual GHG emission reductions by the company	Company	Emissions	Absolute and/or relative actual GHG emission reductions are demonstrated and periodically published	3.2.2

Indicator	Common units	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related BEMP ⁽²⁾
Inclusion of LCA according to the ISO standards 14040 and 14044 in the environmental strategy of the company and use of LCA when taking major decisions for developing new and redesigned products	Y/N	Electrical and electronic equipment manufacturers	This indicator refers to whether LCA is integrated into the environmental strategy of the company and whether its use supports major decisions for developing new or redesigned products	Company	Energy efficiency Material efficiency Water Waste Biodiversity Emissions	LCA is carried out according to the international standards ISO 14040 and ISO 14044. The company carries out LCA for new and redesigned products and the results are systematically used as a basis for product development choices	3.2.3
Formulation of procurement guidelines and requirements for the most relevant products and materials identified in the biodiversity assessment	Y/N	Electrical and electronic equipment manufacturers	This indicator refers to whether biodiversity procurement guidelines and requirements are developed for the products and materials identified as most relevant in the periodic assessment of biodiversity impacts of products and materials provided by the supply chain	Company	Biodiversity	The company implements a programme for a periodic assessment of biodiversity impacts of products and materials provided by the supply chain and the results of the assessment are used to formulate procurement guidelines and requirements on the most relevant products and materials	3.2.4

Indicator	Common units	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related BEMP ⁽²⁾
BEMPs fostering a more circular economy							
Setting of circular economy objectives for new products	Y/N	Electrical and electronic equipment manufacturers	This indicator refers to the presence of circular economy objectives for new products or product groups	Company	Material efficiency	The company has put in place circular economy objectives for new products and an effective product design process to ensure these are achieved	3.3.1
Share of products or components (by number or revenue) for which design cycles or redesign cycles have been embarked upon that explicitly address the different approaches of circular economy	%	Electrical and electronic equipment manufacturers	Number of products or components for which design or redesign cycles that explicitly address the different approaches to the circular economy have been implemented divided by the total number of products or components produced by the company	Company	Material efficiency	N/A	3.3.1
Implementation of the IPSO model ensuring that it delivers environmental benefits	Y/N	Electrical and electronic equipment manufacturers	This indicator monitors whether an IPSO model that aims at improving the environmental performance of products is in place	Company	Material efficiency	The company adopts IPSO in its business ensuring that it leads to a continuous improvement of the environmental performance of the product service offered	3.3.2

Indicator	Common units	Main target group	Short description	Recommended minimum level of monitoring	Related EMAS core indicator ⁽¹⁾	Benchmark of excellence	Related BEMP ⁽²⁾
Take-back rates of products installed at customer premises within the IPSO per product category	%	Electrical and electronic equipment manufacturers	This indicator is expressed as the percentage of products installed on customer premises within the IPSO model and taken back by the manufacturer for redeployment or refurbishment for further use	Company	Material efficiency	100 % take-back rate for post-consumer devices from leasing contracts and 30 % refurbishment rate	3.3.2
Share of reused devices out of the total number of devices installed within the IPSO	%	Electrical and electronic equipment manufacturers	This indicator is expressed as the number of reused devices divided by the total number of devices installed within an IPSO model by the company	Company	Material efficiency	N/A	3.3.2
Use of LCA to demonstrate that the remanufacturing or refurbishment activities have environmental net benefits, including in light of energy efficiency gains of new product models	Y/N	Electrical and electronic equipment manufacturers	This indicator refers to the use of LCA for demonstrating the actual environmental net benefits of the remanufacturing or refurbishment activities	Company	Material efficiency	LCA is used to demonstrate that the remanufacturing or refurbishment activities have environmental net benefits, including in light of energy efficiency gains of new product models	3.3.3
Total amount of recycled plastics from pre-consumer waste used in manufacturing	Tonnes	Electrical and electronic equipment manufacturers	Weight of recycled plastics from pre-consumer waste used for the manufacturing of electrical and electronic equipment	Site/company	Material efficiency	N/A	3.3.4
Total amount of recycled plastics from post-consumer waste used in manufacturing	Tonnes	Electrical and electronic equipment manufacturers	Weight of recycled plastics from post-consumer waste used for the manufacturing of electrical and electronic equipment	Site/company	Material efficiency	N/A	3.3.4

⁽¹⁾ EMAS core indicators are listed in Annex IV to Regulation (EC) No 1221/2009 (Section C.2).

⁽²⁾ The numbers refer to the sections in this document.

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