EUROPEAN COMMISSION
DG Joint Research Centre
Directorate B – Growth and Innovation
Circular Economy and Industrial Leadership
European IPPC Bureau

Seville, 30 April 2021

KICK-OFF MEETING

FOR THE REVIEW OF THE

BEST AVAILABLE TECHNIQUES (BAT) REFERENCE DOCUMENT FOR THE CERAMIC MANUFACTURING INDUSTRY (CER BREF)

Web-based meeting, 10 – 25 February 2021

MEETING REPORT

Edificio Expo, C/Inca Garcilaso 3, E-41092 Seville – Spain
Telephone: +34-95 44 88 218
E-mail: JRC-B5-EIPPCB@ec.europa.eu, Internet: http://eippcb.jrc.ec.europa.eu/

TABLE OF CONTENTS

ACRONYMS

General acronyms – Definitions

Acronym	Meaning
BAT	Best Available Techniques (as defined in Article 3(10) of the IED)
BAT-AEL	Emission levels associated with the BAT (as defined in Article 3(13) of the IED)
BAT-AEPL	Environmental performance levels associated with the BAT (see Section 3.3 of Commission Implementing Decision 2012/119/EU); BAT-AEPLs include BAT-AELs
BATIS	Best Available Techniques Information System
BP	Background Paper
BREF	BAT Reference Document (as defined in Article 3(11) of the IED)
BREF Guidance	Commission Implementing Decision 2012/119/EU
CBI	Confidential Business Information
CER BREF	BAT Reference Document for the Ceramic Manufacturing Industry
CER sector	The ceramic manufacturing industry sector
CLM BREF	Best Available Techniques (BAT) Reference Document for the Production of Cement, Lime and Magnesium Oxide
Covid-19	Coronavirus disease 2019
ECHA	European Chemicals Agency
EFS BREF	BAT Reference Document on Emissions from Storage
EIPPCB	European Integrated Pollution Prevention and Control Bureau
ELV	Emission limit value
ENE BREF	BAT Reference Document for Energy Efficiency
E-PRTR	European Pollutant Release and Transfer Register
EU ETS	European Union Emissions Trading System established by Directive 2003/87/EC
EU	European Union
GLS BREF	BAT Reference Document for the Manufacture of Glass
ICS BREF	BAT Reference Document on Industrial Cooling Systems
IED	Industrial Emissions Directive (2010/75/EU)
IPs	Initial positions
IPPC	Integrated Pollution Prevention and Control
KEI	Key environmental issue
KoM	Kick-off Meeting
LCP BREF	BAT Reference Document for Large Combustion Plants
MCP	Medium Combustion Plants
MS	Member State
NGO	Non-Governmental Organisation
REACH	Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals
STM BREF	BAT Reference Document for the Surface Treatment of Metals and Plastics
STS BREF	BAT Reference Document on Surface Treatment Using Organic Solvents
TWG	Technical Working Group
US EPA	United States Environmental Protection Agency
WFD	European Union Water Framework Directive (2000/60/EC)
WGC	Common Waste Gas Management and Treatment Systems in the Chemical Sector
WI BREF	BAT Reference Document for Waste Incineration
WT BREF	BAT Reference Document for Waste Treatment
WWTP	Waste water treatment plant

Substances, groups of substances and parameters

Acronym	Meaning
AOX	Adsorbable organically bound halogens
CMR	Carcinogenic, mutagenic or toxic for reproduction
CO	Carbon monoxide
CO_2	Carbon dioxide
COD	Chemical oxygen demand
HOI	Hydrocarbon oil index: the sum of compounds extractable with a hydrocarbon solvent (including long-chain or branched aliphatic, alicyclic, aromatic or alkyl-substituted aromatic hydrocarbons)
PAHs	Polycyclic aromatic hydrocarbons
PCDD/Fs	Polychlorinated dibenzo-*p*-dioxins/furans
SVHC	Substance of very high concern: a chemical substance (or part of a group of substances) which has to be regulated by REACH if used within the European Union
THC	Total hydrocarbons
TOC	Total organic carbon
TSS	Total suspended solids
TVOC	Total volatile organic carbon
VOC	Volatile organic compound (as defined in Article 3(45) of the IED)

Participants in the Kick-off Meeting

Acronym	Participant	Number of participants in the Kick-off Meeting
Member States		
AT	Austria	2
BE	Belgium	3
BG	Bulgaria	1
CY	Cyprus	1
CZ	Czechia	4
DE	Germany	4
DK	Denmark	2
EE	Estonia	1
EL	Greece	2
ES	Spain	10
FI	Finland	2
FR	France	4
HR	Croatia	1
HU	Hungary	1
IT	Italy	4
NL	Netherlands	2
PL	Poland	4
PT	Portugal	3
RO	Romania	1
SK	Slovakia	1
SE	Sweden	2
Environmental non-governmental organisations		
EEB	European Environmental Bureau	4
Industry associations		
CU	Cerame-Unie, the European Ceramic Industry Association	20
EXCA	European Expanded Clay Association	5
FEPA	Federation of European Producers of Abrasives	1
IMA	European Industrial Minerals Association	6
European Commission		
DG ENV	Directorate-General for Environment	4
DG JRC - EIPPCB	Directorate-General Joint Research Centre - European IPPC Bureau	6
European Agency		
ECHA*	European Chemicals Agency	1
Research institutions		
UC*	University of Cambridge (UK)	1
Total		**Total: 103**

* participated as observer

1 INTRODUCTION

1.1 Kick-off Meeting for the review of the CER BREF

The Technical Working Group (TWG) for the review of the Best Available Techniques Reference Document for the Ceramic Manufacturing Industry (CER BREF) held its Kick-off Meeting (KoM) as a series of six web-based sessions in the period from 10 to 25 February 2021.

TWGs are set up to facilitate the exchange of information under Article 13(1) of the Industrial Emissions Directive (2010/75/EU).

The review of the CER BREF started in May 2019 with the reactivation of the TWG by the EIPPCB. Subsequently, the EIPPCB sent a call for initial positions on 26 September 2019, with a deadline for responses of 26 November 2019. Seventeen stakeholder groups responded: 13 Member States (AT, BE, CZ, DE, DK, ES, FI, FR, IT, NL, PL, PT, and SE), 2 industry associations (CU and FEPA), one environmental NGO (EEB), and the United Kingdom. Based on these responses, a Background Paper (BP) was prepared by the EIPPCB to facilitate the discussion at the Kick-off Meeting. The BP lists the proposals of the EIPPCB made in the call for initial positions, summarises and assesses the initial positions of TWG members on those proposals, and presents the modified EIPPCB proposals. Following the assessment of initial positions, the BP identified items for discussion (BP Section 2) and not for discussion at the KoM (BP Section 3).

The EIPPCB uploaded the BP to BATIS on 24 April 2020 and planned to organise a KoM in May 2020. However, the Covid-19 pandemic had made it infeasible to organise physical face-to face events by then. With a clear preference of the TWG for holding a physical meeting, the EIPPCB postponed the KoM to autumn 2020. When it became apparent that Covid-19 would render a physical meeting infeasible in the midterm, it was decided to organise the KoM as a series of six web-based sessions between 10 and 25 February 2021 (Table 1). An informal web-based Welcome session for the CER TWG was held on 28 October 2020. During this session, it was agreed to extend the commenting period on the BP to 31 December 2020.

The KoM started on Wednesday 10 February 2020 in the morning and finished on Thursday 25 February 2020 at midday. The agenda included presentations and discussions on, for example, scope, key environmental issues, consumption of energy, water, and materials and other items relevant for the review of the CER BREF. In response to the reactions and additional comments on the BP received by 31 December 2020, it was decided to discuss several items at the KoM that were proposed as not for discussion in the BP (see Table 1).

The Head of the EIPPCB chaired the KoM. The CER BREF co-authors (i.e. the CER BREF team of the EIPPCB) introduced each topic and led the technical discussions. Agreement of the TWG was sought on the following key items: 1) scope of the revised CER BREF, 2) interface with other BREFs, 3) structure of the revised CER BREF, 4) key environmental issues, 5) data collection and next steps for the review of the CER BREF.

All items were discussed in a similar manner. First, the EIPPCB presented the original proposal or request for information as included in the call for initial positions. This was followed by an overview of the initial positions of TWG members and the subsequent assessment by the EIPPCB. Afterwards, the modified EIPPCB proposal was presented. TWG members then had the opportunity to express their positions, respond to the interventions of others, and reach a consensus, which often led to further modifications of the proposal.

Table 1: Agenda of the KoM

Item	BP Section #
Session 1: 10 February 2021	
Welcome, Meeting rules, Tour de table	-
Introductory presentation by DG ENV	-
Introductory presentation by the EIPPCB – The Sevilla process	-
Introductory presentation the EIPPCB – Overview of the work carried out so far on the CER BREF review, Structure of the meeting	-
Scope	3.1.1, 2.1.1, 2.1.2.1, 2.1.2.2, 3.1.2.2
KEIs air and water – presentation of the approach	2.2.2
KEIs air (benzene)	2.2.3.1.1
Session 2: 12 February 2021	
KEIs air (Boron, formaldehyde, lead and its compounds, PAHs, naphthalene, gaseous chlorides, gaseous fluorides, NO_X, SO_X, TVOC, CO_2 and other parameters)	2.2.3.1.2-5, 2.2.3.2.2, 2.2.3.2.5, 3.3.1.1.2-6
Session 3: 16 February 2021	
KEIs air (PCDD/Fs, phenols, acetaldehyde, styrene, other metals/metalloids)	2.2.3.1.6-7, 2.2.3.2.1, 2.2.3.2.3-4
KEIs air (items not for discussion, presentation of proposals: dust, odour, noise, contextual information on CO)	3.3.1.1.1, 3.3.1.1.7-8, 3.3.1.2.1
KEIs water (AOX, naphthalene, boron and its compounds, metals, THC/HOI)	2.2.4.1.1-4, 2.2.4.2.1
KEIs water (items not for discussion, presentation of proposals: TOC and COD, TSS, other metals/metalloids, phenols, PAHs, formaldehyde, ammonium-N, other parameters, contextual information)	3.3.2.2.1-2, 3.3.2.3.1-6, 3.3.2.4
Session 4: 18 February 2021	
KEIs consumption (energy, water and amount of water discharged, raw materials and chemicals)	2.2.5-7
KEI waste generated	2.2.8
Data collection	2.3.1.1-2
Session 5: 23 February 2021	
Data collection – confidentiality issues	2.3.2
Any other business (Subgroups for a circular and carbon-neutral economy and for data collection and questionnaire development)	-
Any other business (Presentation by Cambridge University)	-
Any other business (Presentation of other proposals not for discussion)	3.1.2.1, 3.1.2.3, 3.1.3, 3.2, 3.2.1, 3.3.2.1, 3.4.1-4, 3.4.4.1-2, 3.5.1-4
Introduction to BATIS	-
Session 6: 25 February 2021	
Summary conclusions	-
Next steps	2.4
Site visits	-
Closure of the meeting	-

N.B: each online session was preceded by a 30-minutes connection period; BP Section 2 comprises items proposed for discussion, BP Section 3 comprises items not proposed for discussion at the KoM

This document summarises the discussion at the KoM and presents all conclusions reached by the TWG. It does not list or repeat all interventions but rather provides a synthetic overview of arguments put forward in order to conclude on the proposals.

The subsequent Sections 2-8 present first the EIPPCB proposal, then a summary of the discussion, and at the end the conclusions reached by the TWG. For transparency, all conclusions that were formally adopted by the TWG are highlighted in grey boxes. For brevity, the presentation of the EIPPCB proposal is omitted where it is similar to the final conclusions (as is generally the case for items not proposed for discussion in Section 3 of the BP).

All presentations given and conclusions reached at the KoM are available to TWG members and observers in BATIS.

As of 26 March 2021, the TWG consists of 152 members representing EU Member States, industry associations, an environmental NGO, and the European Commission and 2 observers, one each from ECHA and the University of Cambridge (UK). Of these, 101 TWG members (55 from Member States, 32 from industry, 4 from an environmental NGO and 10 from the European Commission) as well as the 2 observers attended the KoM.

1.2 Introductory presentations

The Head of the EIPPCB opened the KoM and welcomed TWG members and observers. Following a short presentation on meeting rules and a 'tour de table', a representative of the Directorate-General for Environment of the European Commission (DG ENV) gave a presentation: 1) recalling the overall context and legal framework the CER BREF review, 2) emphasising new policy priorities towards a decarbonised, zero-pollution and circular economy under the European Green Deal and 3) explaining the preparatory work of DG ENV for the review of the IED.

The EIPPCB gave a general introduction to the *Sevilla process* for drawing up and reviewing BREFs. The presentation highlighted the approach to derive BAT and BAT-associated environmental performance levels (BAT-AEPLs), which is a pragmatic and iterative process involving the whole TWG. In this process, the EIPPCB's responsibility is to make concrete proposals on BAT and BAT-AEPLs to the whole TWG based on the information collected, especially based on the plant-specific data collected through questionnaires. The TWG is invited to comment on these proposals and to submit any evidence supporting alternative proposals. Decisions on BAT are taken by consensus by the whole TWG at the Final Meeting.

The work of the CER TWG will follow the BREF Guidance for the exchange of information under the IED as stated in Commission Implementing Decision 2012/119/EU.

2 SCOPE OF THE CER BREF

2.1 Ceramic manufacturing sectors

In BP Section 3.1.1, the EIPPCB proposed the following:

- To include in the scope of the CER BREF the activities listed in point 3.5 of Annex I to the IED and to focus on the nine sectors already present in the 2007 BREF, but not to limit the scope of the CER BREF only to those sectors.

The EIPPCB included this proposal in Chapter 3 of the BP as an item not for discussion at the KoM. However, two MS and two industry associations commented on the proposal and it was thus decided to include it in the discussion at the KoM.

One MS proposed to include under the scope of the CER BREF certain directly associated activities such as spray drying that may be carried out in independent installations. It was also discussed whether inorganic bonded abrasives, technical ceramics and ornamental ware sectors should be included in the scope of the CER BREF.

DG ENV explained the interpretation of activity 3.5 of Annex I to the IED. The EIPPCB reminded the TWG that legal discussions on the interpretation of the IED are not within the objectives of the KoM.

Conclusions reached by the TWG:

- To include in the scope of the CER BREF the activities listed in point 3.5 of Annex I to the IED, to focus on the nine sectors already present in the 2007 BREF but not to limit the scope of the CER BREF only to those sectors and to include directly associated activities, e.g. spray drying.
- The TWG to decide at a later stage, based on the information collected, if any of the following three sectors will be covered by sector-specific BAT conclusions: inorganic bonded abrasives, technical ceramics as well as table and ornamental ware.

2.2 Ceramic manufacturing process steps

In BP Section 2.1.1, the EIPPCB proposed the following:

- To cover in the CER BREF the following process steps:
  - storage and handling of raw materials;
  - preparation of raw materials;
  - mixing of raw materials;
  - shaping/forming of ware;
  - drying of ware;
  - surface treatment and decoration of ware;
  - firing of ware;
  - subsequent treatment (ceramic product finishing);
  - addition of auxiliary materials to the ceramic product;
  - sorting, packaging and storage of ceramic products.
- Not to include in the scope of the CER BREF the quarrying of raw materials (e.g. clays), the upstream processing of raw materials (e.g. calcining) and the production of magnesium oxide.
- To include where appropriate cross-references to other BREFs (e.g. CLM, LVIC, SIC).

With the Circular Economy Action Plan of the European Commission in mind, the environmental NGO proposed to account for the environmental impacts of upstream activities and develop value-chain BAT. Three MS and two industry associations asked to exclude the quarrying of raw materials. The TWG discussed further whether associated activities not addressed in other BREFs should be covered in the CER BREF. It was agreed to include the following note in the conclusions: "*The TWG to consider the possibility of developing "value-chain BAT" which will be under the control of the operator.*"

Conclusions reached by the TWG:

- To cover in the CER BREF the proposed process steps:
  - storage and handling of raw materials;
  - preparation of raw materials;
  - mixing of raw materials;
  - shaping/forming of ware;
  - drying of ware;
  - surface treatment and decoration of ware;
  - firing of ware;
  - subsequent treatment (ceramic product finishing);
  - addition of auxiliary materials to the ceramic product;
  - sorting, packaging and storage of ceramic products.
- Not to include in the scope of the CER BREF the quarrying of raw materials (e.g. clays).
- To only include in the scope of the CER BREF the upstream processing of raw materials (e.g. calcining) if directly associated with the main activity and not covered by another BREF.
- To include where appropriate cross-references to other BREFs (e.g. MWEI, CLM, LVIC, SIC).

Note: The TWG to consider the possibility of developing "value-chain BAT" which will be under the control of the operator.

2.3 Interface with other BREFs

2.3.1 Interface with the LCP BREF and MCP Directive

In BP Section 2.1.2.1, the EIPPCB proposed the following:

- To include in the scope of the CER BREF on-site combustion plants that generate hot gases for direct contact heating, drying or any other treatment of objects or materials.
- To exclude from the scope of the CER BREF on-site combustion plants whose radiant and/or conductive heat is transferred to objects or feed material through a solid wall.

The proposal was briefly discussed. The environmental NGO proposed to include, where appropriate, a cross-reference to the MCP Directive (EU) 2015/2193.

Conclusions reached by the TWG:

- To include in the scope of the CER BREF on-site combustion plants that generate hot gases for direct contact heating, drying or any other treatment of objects or materials.
- To exclude from the scope of the CER BREF on-site combustion plants whose radiant and/or conductive heat is transferred to objects or feed material through a solid wall.
- To include where appropriate cross-references to the MCP Directive.

2.3.2 Interface with the WT BREF

In BP Section 2.1.2.2, the EIPPCB proposed the following:

- To cover in the CER BREF the direct recovery (i.e. without pretreatment) of waste in ceramic manufacturing installations.
- To exclude waste treatment covered by the WT BREF from the scope of the CER BREF.
- To address in the CER BREF techniques related to the management of waste.

In the discussion, two MS suggested that the proposal should also refer to residues and not only to waste. Pretreatment techniques of residues/waste, such as grinding, are considered to be included in the third bullet point of the proposal.

Conclusions reached by the TWG:

- To cover in the CER BREF the direct recovery (i.e. without pretreatment) of waste/residues in ceramic manufacturing installations.
- To exclude waste treatment covered by the WT BREF from the scope of the CER BREF.
- To address in the CER BREF techniques related to the management of waste/residues.

2.3.3 Interface with the WI BREF

In BP Section 3.1.2.2, the EIPPCB proposed to define the interface between the CER BREF and the WI BREF. The proposal was not foreseen for discussion in the KoM. However, two industry associations and one MS provided comments on this proposal and it was thus decided to discuss it in the KoM. Following the discussion, the TWG agreed to keep the proposal unchanged.

Conclusions reached by the TWG:

- To cover in the CER BREF the co-incineration of waste in ceramic manufacturing kilns.
- To exclude waste incineration covered by the scope of the WI BREF from the scope of the CER BREF.

2.3.4 Interface with the GLS BREF

In BP Section 3.1.2.1, the EIPPCB proposed to define the interface between the CER BREF and the GLS BREF. The proposal was not foreseen for discussion in the KoM; TWG members did not request to discuss it before or during the KoM and thus the EIPPCB proposal was adopted.

Conclusions reached by the TWG:

- To cover in the CER BREF the use of glassy materials (e.g. frits) in surface treatment processes (i.e. glazing) of ceramic products.
- Not to include in the scope of the CER BREF:
  - the manufacturing of glass ceramics;
  - the production of refractory ceramic fibres;
  - the production of frits.

2.3.5 Interface with the STM BREF

In BP Section 3.1.2.3, the EIPPCB proposed to define the interface between the CER BREF and the STM BREF. The proposal was not foreseen for discussion in the KoM; TWG members did not request to discuss it before or during the KoM and thus the EIPPCB proposal was adopted.

Conclusions reached by the TWG:

- To exclude porcelain/vitreous enamelling of metals from the scope of the CER BREF.

2.4 Independently operated waste water treatment plants (WWTPs) and combined treatment of waste water

In BP Section 3.1.3, the EIPPCB proposed to define the scope of the CER with respect to WWTPs and combined treatment of waste water. This item was not proposed for discussion in the BP, it was presented at the KoM and it was adopted.

Conclusions reached by the TWG:

- To include in the scope of the CER BREF the activity listed in point 6.11 of IED Annex I (i.e. independently operated treatment of waste water not covered by Directive 91/271/EEC) when the main pollutant load originates from the activities covered by the scope of the CER BREF.
- To include in the scope of the CER BREF the combined treatment of waste water from different origins provided that the main pollutant load originates from the activities covered by the scope of the CER BREF and that the waste water treatment is not covered by Directive 91/271/EEC.

3 STRUCTURE OF THE CER BREF AND ITS BAT CONCLUSIONS

In BP Section 3.2, the EIPPCB proposed to follow and where needed adapt the structure of the 2007 CER BREF during the review. The proposal was not foreseen for discussion in the KoM; TWG members did not request to discuss it before or during the KoM and thus the EIPPCB proposal was adopted.

Conclusions reached by the TWG:

- To generally use the following structure, which can be adapted depending on the information and data collected during the CER BREF review:
  - Preface
  - Scope
  - Chapter 1: General information about the CER sector
  - Chapter 2: Applied processes and techniques
  - Chapter 3: Current emission and consumption levels
  - Chapter 4: Techniques to consider in the determination of BAT
  - Chapter 5: BAT conclusions
    - General BAT conclusions
    - Specific BAT conclusions
  - Emerging techniques
  - Concluding remarks and recommendations for future work
  - Annexes
  - References
  - Glossary

3.1 Applied processes and techniques in the current BREF

In BP Section 3.2.1, the EIPPCB proposed to update the process descriptions and techniques in the 2007 CER BREF with information provided by the TWG. The proposal was not foreseen for discussion in the KoM; TWG members did not request to discuss it before or during the KoM and thus the EIPPCB proposal was adopted.

Conclusions reached by the TWG:

- To update the process descriptions listed in Chapter 2 of the CER BREF with the information provided by the TWG, in particular on the following topics:
  - reduction firing of bricks, decoration (or third) firing, debinding of technical ceramics;
  - continuous pressing technologies for the shaping of ware;
  - decoration of ware using ink-jet technologies;
  - application of fibreglass mats to the ceramic tile products.
- The TWG to provide written contributions on the processes and techniques referred to above in order to be considered in the CER BREF review (see Section 8 of this document for a tentative timeline).

4 EMISSIONS TO AIR AND TO WATER

4.1 Overview

A large part of the KoM was dedicated to discussing and agreeing upon the key environmental issues (KEIs) to be addressed in the review of the CER BREF and the related substances/groups of substances/parameters to be included in the data collection through plant-specific questionnaires. It was also discussed in detail whether data on pollutants emitted to air and to water should be collected with the aim to derive BAT-associated emission levels (BAT-AELs) or with the aim to provide the TWG with evidence to decide at a later stage, based on the data collected, whether BAT-AELs should be derived. This section addresses emissions to air and to water. Parameters related to the consumption of energy, water, raw materials and chemicals as well as to waste water discharge and waste/residues generation are addressed in Section 5.

Unless specified otherwise, for substances/groups of substances/parameters that are not proposed as KEIs, no data will be collected via questionnaires and no BAT-AEPLs will be set. However, 'bulk information' on associated techniques can be collected by the TWG and may be considered for the review of the CER BREF (see Section 8).

In total, more than 70 substances/groups of substances/parameters, which might potentially be relevant when considering emissions to air and to water from ceramic installations, were included as candidate KEIs in the BP. These substances/groups of substances/parameters were assessed by the EIPPCB based on the initial positions provided by TWG members and on available scientific and technical information.

The EIPPCB assessment was based on the following four criteria:

1. the environmental relevance of a substance/group of substances/parameters;
2. the significance of an activity, i.e. its contribution to the overall (industrial) emissions in the EU;
3. the potential of the BREF review for identifying new or additional techniques that would further significantly reduce pollution;
4. the potential of the BREF review to set BAT-AELs that would significantly decrease current emission levels.

This approach was detailed in the BP and in the EIPPCB presentation made at the KoM.

This document does not aim to report the detailed discussions at the KoM for each and every substance/group of substances/parameters. Instead, it focuses on the most important points. The list of KEIs included in the review of the CER BREF is summarised in Table 2 and Table 4 (Sections 4.2 and 4.3). The TWG did not discuss in detail proposals from BP Section 3 intended 'not for discussion' at the KoM. These proposals were presented and discussed together.

4.2 Emissions to air

Based on the proposals made by the EIPPCB in the BP and on the discussions that took place during the KoM for each substance/group of substances/parameters, the TWG concluded to include in the review of the CER BREF the KEIs and other parameters included in Table 2.

During the KoM, the TWG discussed modifying several initial proposals:

- To remove the reference to certain process steps for substances included as KEIs.
- To specify that the TWG will decide at a later stage based on the data collected for which sectors/processes BAT-AELs should be derived.
- For emissions of certain substances from drying, to collect data in the event that hot gases for the firing zone are used.

In the BP, it was proposed to collect information on techniques related to the reduction of CO_2 emissions. The TWG recognised the ambitions of the European Green Deal to transform Europe into a climate-neutral economy by 2050. It was also acknowledged that CO_2 emissions are a key aspect for the sector and for the decarbonisation of manufacturing industries. During the discussion, industry associations expressed concerns about the possibility of establishing BAT-AELs for CO_2 emissions for plants that are included in the EU ETS. On the other side, the environmental NGO and one MS supported the possibility to derive BAT-AELs for all plants. It was agreed that BAT-AELs will not be derived for plants covered under the scope of the EU ETS (see Table 2).

In the BP, it was proposed to include CO as contextual information on NOX emissions. During the KoM, three MS and the environmental NGO expressed their support for collecting information not only as a contextual parameter but also because CO may be linked to process emissions, energy efficiency and firing conditions of certain products. It was thus agreed to collect data through plant-specific questionnaires on CO emissions to air (see Table 2).

Table 2: Emissions to air included in the review of the CER BREF

Substance(s)	KoM conclusions
Benzene	To include benzene as a KEI for firing and drying, and to collect data on benzene emissions to air through plant-specific questionnaires with the aim to derive BAT-AELs. The TWG to decide at a later stage, based on the data collected through the questionnaires, for which sectors/processes BAT-AELs should be derived for benzene emissions to air.
Boron and its compounds	To include boron as a KEI, and to collect data on boron emissions to air through plant-specific questionnaires for the sectors/processes where boron-containing materials are used. The TWG to decide at a later stage, based on the data collected through the questionnaires, for which sectors/processes BAT-AELs should be derived for boron emissions to air.
Formaldehyde	To include formaldehyde as a KEI and to collect data on formaldehyde emissions to air through plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, for which sectors/processes BAT-AELs should be derived for formaldehyde emissions to air.

Substance(s)	KoM conclusions
Lead and its compounds	To include lead as a KEI and to collect data through plant-specific questionnaires on lead emissions to air, where lead-containing materials, lead-containing fuels (such as coal, pet coke, heavy fuel oil) and/or lead-containing waste/residues are used. The TWG to decide at a later stage, based on the data collected through the questionnaires, for which sectors/processes BAT-AELs should be derived for lead emissions to air. EEB and CERAME-UNIE to provide information and data on the use of deinking sludge in the CER sector.
PAHs	To include PAHs (e.g. 16 US EPA PAHs) as a KEI and to collect data on PAHs emissions to air through plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, for which sectors/processes BAT-AELs should be derived for PAHs emissions to air, as a sum and/or for individual compounds (e.g. naphthalene).
Naphthalene	Naphthalene is included as a KEI in the PAHs.
Gaseous chlorides	To include gaseous chlorides expressed as HCl as a KEI for firing and to collect data on gaseous chlorides emissions to air through plant-specific questionnaires with the aim to derive BAT-AELs. For drying, to collect data on gaseous chlorides emissions in the event that hot flue-gases from the firing zone(s) are used. The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs should be derived.
Gaseous fluorides	To include gaseous fluorides expressed as HF as a KEI for firing and to collect data on gaseous fluorides emissions to air through plant-specific questionnaires with the aim to derive BAT-AELs. For drying, to collect data on gaseous fluorides emissions in the event that hot flue-gases from the firing zone(s) are used. The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs should be derived.
NO_X	To include NO_X as a KEI for firing and to collect data on NO_X emissions to air through plant-specific questionnaires with the aim to derive BAT-AELs. For drying and raw material preparation, to collect data on NO_X emissions. The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs should be derived.
SO_X	To include SO_X as a KEI for firing and to collect data on SO_X emissions to air through plant-specific questionnaires with the aim to derive BAT-AELs. For drying and raw material preparation, to collect data on SO_X emissions. The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs should be derived.

Substance(s)	KoM conclusions
TVOC	To include TVOC as a KEI for firing and to collect data on TVOC emissions to air through plant-specific questionnaires with the aim to derive BAT-AELs. For other processes (e.g. drying, debinding, finishing), to collect data on TVOC emissions. The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs should be derived.
Carbon dioxide	Recognising the key importance of CO_2 emissions in the context of the European Green Deal, to collect information on techniques related to the reduction of CO_2 emissions from ceramic manufacturing plants and to collect data on CO_2 emissions to air as contextual information through plant-specific questionnaires. Not to derive BAT-AELs for plants covered under the scope of the ETS.
Ammonia	When SCR/SNCR is used for NO_X abatement, to include ammonia as a KEI for emissions to air and to collect data on ammonia emissions to air through plant-specific questionnaires.
PCDD/Fs	To include PCDD/Fs as a KEI for firing and to collect data on PCDD/Fs emissions to air through plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, for which sectors BAT-AELs should be derived. For drying, to collect data on PCDD/F emissions in the event that hot flue-gases from the firing zone(s) are used. The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs should be derived.
Phenols	To include phenols as a KEI and to collect data on phenols emissions to air through plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, for which sectors/processes BAT-AELs should be derived for phenols emissions to air. The TWG to decide during the questionnaire development for which phenols compounds emission data should be collected.
Acetaldehyde	To include acetaldehyde as a KEI and to collect data on acetaldehyde emissions to air through plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, for which sectors/processes BAT-AELs should be derived for acetaldehyde emissions to air.
Styrene	To include styrene as a KEI where polystyrene is used and to collect data on styrene emissions to air through plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, for which sectors/processes BAT-AELs should be derived for styrene emissions to air.

Substance(s)	KoM conclusions
Other metals/metalloids	To include metals/metalloids as a KEI and to collect data on emissions to air of As, Cd, Cr, Cr(VI), Co, Cu, Hg, Mn, Ni, Sb, Se, Sn, Tl, Te, V and Zn through plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, for which sectors/processes BAT-AELs should be derived for metals/metalloids as a sum or for individual compounds.
Dust	To include dust as a KEI for all processes and to collect data on dust emissions to air through plant-specific questionnaires with the aim to derive BAT-AELs. The TWG to decide at a later stage, based on the data collected through the questionnaires, for which processes BAT-AELs should be derived for dust emissions to air. To collect information on techniques to prevent and/or reduce diffuse dust emissions.
Odour	To include odour as a KEI and to collect information on techniques to prevent and/or reduce odour emissions with the aim to derive BAT without associated environmental performance levels.
Noise	To include noise as a KEI and to collect information on techniques to prevent and/or reduce noise emissions with the aim to derive BAT without associated environmental performance levels.
CO	To collect data through plant-specific questionnaires on CO emissions to air.

Table 3 lists the conclusions reached for substances that are excluded.

Table 3: Emissions to air excluded from the review of the CER BREF

Substance(s)	KoM conclusions
Fibre dust	Not to include fibre dust as a KEI and not to collect data on fibre dust emissions to air through plant-specific questionnaires.
Additional carcinogenic substances	Not to include bromoethane, 1,3-butadiene, 1,2-dichloroethane, 1,2-propyleneoxide (1,2-epoxypropane), styroloxide (styrene oxide), o-toluidine, trichloroethene, vinylchloride as KEIs for emissions to air and not to collect data on emissions of these substances to air through plant-specific questionnaires.
Isocyanates	Not to include isocyanates as a KEI for emissions to air and not to collect data on isocyanate emissions to air through plant-specific questionnaires.

4.3 Emissions to water

Following the proposals in BP Section 2.2.4 and the discussions during the KoM, the TWG concluded to include in the CER BREF review the substances/groups of substances/parameters listed in Table 4.

Overall, industry associations stated that waste water discharge from ceramic manufacturing is very low as water recycling rates may reach 100%. Naphthalene emissions to water were discussed in detail; several MS and the environmental NGO supported collecting data on the grounds of naphthalene's limited short-term biodegradability, while other MS and industry argued naphthalene emissions are irrelevant for most sectors.

In summary, the TWG discussed modifying several initial proposals:

- To decide at a later stage, based on the data collected through questionnaires, for which sectors/processes BAT-AELs should be derived regarding individual pollutants.
- To collect data on naphthalene emissions to water from the inorganic bonded abrasives sector.
- To collect data on boron emissions for the sectors/processes where boron-containing materials are used.
- To include aluminium (Al) and barium (Ba) emissions to water for both direct and indirect discharges and to collect related data through plant-specific questionnaires.
- To collect data on HOI of direct and indirect discharges from processes where hydrocarbon-containing materials/fuels (e.g. lubricants, waxes) are used/handled.
- To collect data on fluoride emissions to water through plant-specific questionnaires and to exclude fluoride from contextual information to be collected.

Table 4: Emissions to water included in the review of the CER BREF

Substance(s) or parameters	KoM conclusions
Waste water sources	To take into account the information provided for the drafting of the revised CER BREF. To collect information on direct and indirect waste water discharges from all sectors through plant-specific questionnaires.
AOX	To include AOX as a KEI for both direct and indirect discharges and to collect data on AOX emissions to water through plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, for which sectors/processes BAT-AELs should be derived for AOX emissions to water.
Naphthalene	To collect data on naphthalene emissions to water from the inorganic bonded abrasives sector through plant-specific questionnaires.

Substance(s) or parameters	KoM conclusions
Boron and its compounds	To include boron as a KEI for both direct and indirect discharges and to collect data on boron emissions to water through plant-specific questionnaires for the sectors/processes where boron-containing materials are used. The TWG to decide at a later stage, based on the data collected through the questionnaires, for which sectors/processes BAT-AELs should be derived for boron emissions to water.
Metals	To include Al, Ba, Cd, Co, Cr, Cu, Ni, Pb and Zn as KEIs for both direct and indirect discharges and to collect data on Al, Ba, Cd, Co, Cr, Cu, Ni, Pb and Zn emissions to water through plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, for which sectors/processes BAT-AELs should be derived for metal emissions to water.
Other metals/metalloids	Not to include As, Hg and Mn as KEIs for emissions to water and not to collect data on As, Hg and Mn emissions to water.
Total Hydrocarbons/HOI	For both direct and indirect discharges, to collect data on HOI for emissions to water through plant-specific questionnaires for the processes where hydrocarbon-containing materials/fuels (e.g. lubricants, waxes) are used/handled. The TWG to decide at a later stage, based on the data collected through the questionnaires, for which processes BAT-AELs should be derived for HOI in relation to emissions to water.
TOC and COD	To include both TOC and COD as KEIs for direct discharges and to collect data on TOC and COD emissions to water through plant-specific questionnaires. To aim to derive BAT-AELs for direct emissions of TOC and COD to water, with the possibility to use only one of the two, but with preference being given to TOC. To collect data on emissions of poorly biodegradable compounds (as part of TOC and COD) to water for indirect discharges. The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AELs on the biodegradability of the COD/TOC content sent to biological treatment through indirect discharges should be derived.
TSS	To include TSS as a KEI for direct discharges and to collect data on TSS emissions to water through plant-specific questionnaires. To aim to derive BAT-AELs for direct TSS emissions to water. To collect data on TSS emissions to water for indirect discharges as contextual information through plant-specific questionnaires.

Substance(s) or parameters	KoM conclusions
Fluoride	To collect data on fluoride emissions to water through plant-specific questionnaires. The TWG to decide at a later stage, based on the data collected through the questionnaires, if and for which sectors/processes BAT-AELs should be derived for fluoride emissions to water.
pH, Conductivity, Chloride, Sulphate	To collect data on the following parameters as contextual information through plant-specific questionnaires: pH, conductivity, chloride, sulphate.

Table 5 lists the conclusions reached for substances that are excluded.

Table 5: Emissions to water excluded from the review of the CER BREF

Substance(s) or parameters	KoM conclusions
Phenols	Not to include phenols as a KEI and not to collect data on phenols emissions to water
PAHs	Not to include PAHs as a KEI for emissions to water and not to collect data on PAHs emissions to water.
Formaldehyde	Not to include formaldehyde as a KEI for emissions to water and not to collect data on formaldehyde emissions to water.
Ammonium-N	Not to include ammonium-N as a KEI for emissions to water and not to collect data on ammonium-N emissions to water.
Other parameters	Not to include brominated diphenyl ethers, benzene and phosphorus as KEIs and not to collect data on brominated diphenyl ether, benzene and phosphorus emissions to water.

5 CONSUMPTION, WATER DISCHARGE AND WASTE/RESIDUES GENERATION

5.1 Consumption of energy

In BP Section 2.2.5, the EIPPCB proposed the following:

- To include specific energy consumption as a KEI for firing kilns, spray dryers and ware dryers and to collect data through plant-specific questionnaires with the aim to derive BAT-AEPLs.
- To include the specific energy consumption of the plant as a KEI and to collect data through plant-specific questionnaires with the aim to derive BAT-AEPLs.
- The TWG to identify the contextual information (e.g. applied techniques, type of processes, fuels and raw materials used, product specifications, methods used for monitoring and calculation, plant configuration and boundaries defined, level of aggregation of consumption data) needed to understand and compare the data collected through plant-specific questionnaires.

The TWG discussed the proposal in detail. Several MS supported it, suggesting that BAT-AEPLs be derived based on provisions in the IED. They argued that experience from other BREFs shows that collecting and analysing complex data is feasible if relevant contextual information is collected in the questionnaire. However, several other MS and three industry associations emphasised the complexity of sectors, suggesting energy consumption is site-, process-, sector-, and material-specific. One MS and the environmental NGO suggested also focusing on 'energy sourcing' as a KEI.

Two revised proposals were presented and discussed with a view to reaching a consensus, clarify wording and ensure consistency with other KoM conclusions.

Conclusions reached by the TWG:

- To include specific energy consumption as a KEI for firing kilns, spray dryers and ware dryers and to collect data through plant-specific questionnaires with the aim to derive BAT-AEPLs.
- To include the specific energy consumption of the plant as a KEI and to collect data through plant-specific questionnaires with the aim to derive BAT-AEPLs.
- Recognising the key importance of energy sourcing (e.g. type of energy carrier) for the CER sector, to collect information on techniques and best practices related to energy sourcing.
- The TWG to decide at a later stage, based on the data collected through the questionnaires, for which sectors/processes BAT-AEPLs should be derived.
- The TWG to identify during the questionnaire development phase the contextual information (e.g. age of the plant, applied techniques, type of processes, energy sources, fuels, raw materials, product specifications, methods used for monitoring and calculation, plant configuration and boundaries defined, level of aggregation of consumption data) needed to understand and compare the data collected through plant-specific questionnaires.

5.2 Consumption of water and waste water discharged

In BP Section 2.2.6, the EIPPCB proposed the following:

- To include specific water consumption and waste water discharge as KEIs and to collect data through plant-specific questionnaires.
- The TWG to identify the contextual information (e.g. applied techniques, type of processes and raw materials used, product specifications, methods used for monitoring and calculation, plant configuration and boundaries defined, level of aggregation of consumption data) needed to understand and compare the data collected through plant-specific questionnaires.
- The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AEPLs on specific water consumption and/or waste water discharge should be derived.
- To collect data on the water recycling rate as contextual information through plant-specific questionnaires.

The TWG agreed in general with the proposal. One MS suggested waste water discharge is small and thus not a KEI. To ensure consistency across KoM conclusions, the following was proposed:

- To add "with the aim of deriving BAT-AEPLs" to the first bullet point.
- To add "during the questionnaire development phase" to the second bullet point.
- To clarify that the TWG will "decide at a later stage, based on the data collected, for which sectors/processes BAT-AEPLs on specific water consumption and/or waste water discharge should be derived".

Conclusions reached by the TWG:

- To include specific water consumption and waste water discharge as KEIs and to collect data through plant-specific questionnaires with the aim to derive BAT-AEPLs.
- The TWG to identify during the questionnaire development phase the contextual information (e.g. applied techniques, type of processes and raw materials used, product specifications, methods used for monitoring and calculation and boundaries defined, level of aggregation of consumption data) needed to understand and compare the data collected through plant-specific questionnaires.
- The TWG to decide at a later stage, based on the data collected, for which sectors/processes BAT-AEPLs on specific water consumption and/or waste water discharge should be derived.
- To collect data on the water recycling rate as contextual information through plant-specific questionnaires.

5.3 Consumption of raw materials and chemicals

In BP Section 2.2.7, the EIPPCB proposed the following:

- To include raw material consumption as a KEI and to collect information on techniques to increase the substitution of raw materials with waste and/or residues and to reduce the raw material consumption with the aim to derive BAT without any associated environmental performance levels.
- To include the specific quantity of hazardous chemicals consumed for a manageable list of hazardous chemicals.
- The TWG to define this manageable list of hazardous chemicals during the questionnaire development phase.
- To collect data on the specific consumption of these hazardous chemicals through plant-specific questionnaires.
- To collect information on potential substitution techniques to prevent or reduce the use of hazardous chemicals (in particular CMR substances and SVHCs).
- The TWG to identify during the questionnaire development phase the contextual information (e.g. applied techniques, type of processes used, product specifications, plant configuration and definition of boundaries, level of aggregation of consumption data) needed to understand and compare the data collected through plant-specific questionnaires.
- The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AEPLs on the specific quantity of hazardous chemicals consumed should be derived.

In the discussion, several MS asked to collect information on the use of pore-forming agents and binders. The environmental NGO proposed to obtain support from ECHA to define a manageable list of hazardous chemicals and collect information on their consumption. Two MS emphasised that hazardous CMR substances/SVHCs should be a KEI; however, the relevance of such substances for ceramics manufacturing should be judged only after the data collection.

One industry association emphasised the limited potential for the substitution of raw materials in the ceramic industry, suggesting BAT on raw materials consumption should be derived without associated environmental performance levels; however, this view was challenged by the environmental NGO and several MS. Two MS suggested that the reuse of internal waste and residues is important and consistent with the objectives of the European Green Deal.

One MS suggested identifying BAT candidates for the specific consumption of packaging materials, whereas another MS feared this may duplicate existing packaging regulation.

To accommodate these comments, the EIPPCB revised the proposal twice and presented the revisions to the TWG for discussion. The final proposal committed to: 1) include pore-forming agents and chemicals as part of raw materials, 2) refer to ECHA support for establishing a manageable list of hazardous chemicals used in the ceramic sectors, and 3) collect information on the specific consumption of packaging materials.

Conclusions reached by the TWG:

- To include raw material (e.g. pore-forming agents, chemicals) consumption as a KEI and to collect information on techniques to increase the substitution of raw materials with waste and/or residues and to reduce the raw material consumption with the aim to derive BAT.
- With the support of ECHA, the TWG to define a manageable list of hazardous chemicals (in particular CMR substances and SVHCs), during the questionnaire development phase.
- To collect data through plant-specific questionnaires on specific consumption of hazardous chemicals identified in the list mentioned above.
- To collect information on potential substitution techniques to prevent or reduce the use of hazardous chemicals (in particular CMR substances and SVHCs).
- The TWG to identify during the questionnaire development phase the contextual information (e.g. applied technique, type of processes used, product specifications, plant configuration and definition of boundaries, level of aggregation of consumption data) needed to understand and compare the data collected through plant-specific questionnaires.
- The TWG to decide at a later stage, based on the data collected through the questionnaires, whether BAT-AEPLs on the specific quantity of hazardous chemicals consumed should be derived.
- To collect information through the plant-specific questionnaires on specific consumption of packaging materials and on techniques to reduce it.

5.4 Waste/residues generated

In BP Section 2.2.8, the EIPPCB proposed the following:

- To include the following waste streams as KEIs and to collect data through plant-specific questionnaires:
    - the specific amount of sludge generated and sent to disposal and/or internal/external recovery;
    - the specific amount of used/broken ware/materials generated and sent to disposal and/or internal/external recovery;
    - the specific amount of flue-gas cleaning waste generated and sent to disposal and/or internal/external recovery.
- The TWG, during the questionnaire development phase, to identify the contextual information (e.g. applied techniques, type of processes, raw materials, product specifications, classification and final destination of waste, plant configuration and boundaries defined, level of aggregation of consumption data) needed to understand and compare the data collected.
- The TWG to decide at a later stage, based on the data collected through the questionnaires, whether and how BAT-AEPLs on specific waste generation and recycling of waste should be derived.

The TWG supported, in general, the EIPPCB proposal. Three MS suggested including a reference to 'residues'. One industry association suggested that there is no need to collect data on the internal reuse of sludge, broken ware or flue-gas cleaning residues. One MS and the environmental NGO proposed to collect data on techniques aimed at preventing waste and enhancing industrial symbiosis. Two MS expressed the opinion that the contextual information should capture the generation of waste/residues.

Following the discussion, the EIPPCB presented an adapted proposal, which referred to "waste/residues" and "on-site/off-site recovery" and proposed to decide at a later point, based on the data collected, for which sectors/processes to derive BAT-AEPLs. This revised proposal was adopted by the TWG.

Conclusions reached by the TWG:

- To include the following waste/residues as KEIs and to collect data through plant-specific questionnaires on:
    - specific amount of sludge generated and sent for disposal and/or on-site/off-site recovery;
    - specific amount of used/broken ware/materials generated and sent for disposal and/or on-site/off-site recovery;
    - specific amount of flue-gas cleaning waste generated and sent for disposal and/or on-site/off-site recovery.
- The TWG to identify during the questionnaire development phase the contextual information (e.g. applied techniques, type of processes, raw materials, product specifications, classification and final destination of waste, plant configuration and boundaries defined, level of aggregation of waste/residues generation data) needed to understand and compare the data collected.
- The TWG to decide at a later stage, based on the data collected through the questionnaires, for which sectors/processes BAT-AEPLs on specific waste/residues generation and recycling of waste/residues should be derived.

5.5 Industrial symbiosis

During the discussion on waste generation (see Section 5.4), one MS and the environmental NGO expressed the wish to collect data on techniques aimed at supporting industrial symbiosis. The EIPPCB had not presented a proposal on this topic. Following the discussion, the TWG agreed to expand the collection of information to address industrial symbiosis.

Conclusions reached by the TWG:

- To collect information on techniques that promote industrial symbiosis.

6 INFORMATION AND DATA COLLECTION

6.1 General

6.1.1 Expression of BAT-AELs for emissions to air/water

In BP Section 2.3.1.1, the EIPPCB proposed the following:

- To generally express BAT-AELs for channelled emissions to air and to water in concentrations, and, if deemed appropriate, also as specific loads.
- To clearly define (during the drafting of the questionnaire) all parameters influencing emission concentrations or loads (e.g. techniques used, reference conditions, type and quantity of products/raw materials, boundaries of the process/system, direct/indirect discharge, sources and characteristics of waste gases and waste waters, specific operating conditions associated with the manufacture of products).

The TWG supported the EIPPCB proposal to generally express BAT-AELs for emissions to air and to water in concentrations and/or if deemed appropriate as specific loads. One MS asked to maintain the option to express BAT-AELs as specific loads. Three MS highlighted the importance of collecting information about the actual process conditions (e.g. heat source(s) for dryers) and reference conditions (e.g. oxygen concentration in the waste gas) at the time of measurement.

Conclusions reached by the TWG:

- To generally express BAT-AELs for channelled emissions to air and to water in concentrations, and, if deemed appropriate, also as specific loads.
- To clearly define (during the drafting of the questionnaire) all parameters influencing reported emission concentrations or loads (e.g. techniques used, reference conditions, type and quantity of products/raw materials, boundaries of the process/system, direct/indirect discharge, sources and characteristics of waste gases and waste waters, specific operating conditions associated with the manufacture of products).

6.1.2 Averaging periods for BAT-AELs for emissions to air/water

In BP Section 2.3.1.2, the EIPPCB proposed the following:

- For channelled emissions to air, to generally express BAT-AELs as short-term averages, i.e. as daily averages (for continuous measurements) or as averages over the sampling period (for periodic measurements).
- For emissions to water, to generally express BAT-AELs in the case of continuous discharges as daily average values obtained via 24-hour flow-proportional composite samples and in the case of batch discharges as average values over the release duration obtained via flow-proportional composite samples. The TWG to decide at a later stage which other sampling techniques could be considered appropriate.

The TWG broadly agreed with the EIPPCB proposal. During the KoM, one MS and the environmental NGO suggested accommodating shorter measurement intervals by replacing ‘i.e.’ with ‘e.g.’ in reference to ‘daily averages’. One MS asked to include a specific reference to batch discharge. It was agreed to generally express BAT-AELs for emissions to air as short-term averages and BAT-AELs for emissions to water as daily averages.

Conclusions reached by the TWG:

- For channelled emissions to air, to generally express BAT-AELs as short-term averages, e.g. as daily averages (for continuous measurements) or as averages over the sampling period (for periodic measurements).
- For emissions to water, to generally express BAT-AELs in the case of continuous discharges as daily average values obtained via 24-hour flow-proportional composite samples and in the case of batch discharges as average values over the release duration obtained via flow-proportional composite samples. The TWG to decide at a later stage which other sampling techniques could be considered appropriate.

6.1.3 Environmental performance levels

In BP Section 3.4.3, the EIPPCB proposed to collect data on: 1) the specific consumption of energy, water, and hazardous chemicals, 2) the specific waste generation and waste water discharge, and 3) the water recycling rate. The proposal was not foreseen for discussion at the KoM. The TWG agreed with the EIPPCB proposal and the inclusion of "residues" next to waste generation.

Conclusions reached by the TWG:

- To collect data on the specific energy consumption of the processes/plants as the ratio of the respective energy consumption divided by a suitable activity rate figure and expressed as yearly averages.
- To collect data on the specific water consumption of the plants as the ratio of the total water consumption divided by a suitable activity rate figure and expressed as yearly averages.
- To collect data on the specific waste water discharge of the plants as the ratio of the total waste water discharge divided by a suitable activity rate figure and expressed as yearly averages.
- To collect data on the water recycling rate of the plants as a percentage and expressed as yearly averages.
- To collect data on the specific consumption of the hazardous chemicals (to identify during the drafting of the questionnaire) as the ratio of the total consumption of hazardous chemicals of the plant divided by a suitable activity rate figure and expressed as yearly averages.
- To collect data on the specific waste/residues generation of the plants as the ratio of the respective waste/residues generated divided by a suitable activity rate figure and expressed as yearly averages for the following streams:
  - waste water sludge;
  - used/broken ware/materials;
  - flue-gas cleaning waste.
- The TWG to decide on suitable activity rate figures for each sector during the drafting of the questionnaire.

6.2 Selection of plants

6.2.1 Ceramic manufacturing installations in the EU

In BP Section 3.4.1, the EIPPCB proposed the following:

- To collect data from well-performing IED plants carrying out activity 3.5 of Annex I to the IED.

The proposal was not foreseen for discussion at the KoM. During the KoM, one industry association suggested updating the number of installations and asked to extend the data collection to summer 2022. The environmental NGO suggested focusing the data collection on well- and best-performing plants, including plants below IED thresholds. This position was supported by two MS. The original EIPPCB proposal was adopted with the addition of "plant-specific questionnaires".

Conclusions reached by the TWG:

- To collect data through plant-specific questionnaires from well-performing IED plants carrying out activity 3.5 of Annex I to the IED.

6.2.2 Selection of plants/installations for the plant-specific information and data collection

In BP Section 3.4.2, the EIPPCB proposed the following:

- The TWG to complete their proposals of well-performing (including best-performing) plants/installations to be included in the data collection.

The proposal was not foreseen for discussion at the KoM; however, two industry associations provided comments on the BP, asking for clarification about the number of plants, the definition of 'well-performing plants', and the scope of the data collection, which should include all plants with a permit. The EIPPCB clarified that the number of plants given in the BP is based on the information received from the TWG, which can be updated; the objective of the data collection is to obtain a sample of plants (including best-performing plants) suitable to establish BAT. The original EIPPCB proposal was adopted with the addition of "plant-specific questionnaire".

Conclusions reached by the TWG:

- The TWG to complete their proposals of well-performing (including best-performing) plants/installations to be included in the data collection through the plant-specific questionnaire.

6.3 Questionnaire for gathering plant-specific information and data

In BP Section 3.4.4, the EIPPCB proposed to follow the established BREF Guidance in the data collection. The proposal was not foreseen for discussion in the KoM; TWG members did not request to discuss it before or during the KoM and thus the EIPPCB proposal was adopted.

Conclusions reached by the TWG:

- To follow the established BREF process for the collection of plant/installation-specific data via questionnaire(s).
- The TWG to take into account the various IPs for the development of the questionnaire.

6.3.1 Collection of data at process level

In BP Section 3.4.4.1, the EIPPCB did not make any additional proposals besides BP Sections 2.2.5-8 on the collection of plant-specific data and information. TWG members did not request to discuss this item before or during the KoM and thus the EIPPCB proposal was adopted.

Conclusions reached by the TWG:

- No additional proposals compared to Sections 2.2.5, 2.2.6, 2.2.7 and 2.2.8.

6.3.2 Data collection procedure

In BP Section 3.4.4.2, the EIPPCB proposed to follow the established BREF process for collecting data. The proposal was not foreseen for discussion in the KoM; TWG members did not request to discuss it before the KoM. However, the reference years for the data collection were briefly discussed during the KoM. Two MS and the environmental NGO suggested to consider collecting data for the year 2020. One MS stated that 2020 was not a normal year for ceramics production due to Covid-19.

To account for Covid-19-related anomalies in ceramics production and the delays in the CER BREF review process, the last bullet point of the proposal was modified to include 2020 and 2021 as possible reference years.

Conclusions reached by the TWG:

- To follow the established BREF process for the collection of plant/installation-specific data via questionnaires including:
  - the preparation of the draft questionnaire by the EIPPCB with the help of the TWG subgroup on data collection and questionnaire development followed by the commenting of the whole TWG, if necessary in several iterations;
  - if deemed necessary, the organisation of a questionnaire development workshop to finalise the questionnaire;
  - the testing of the draft final questionnaire by a selected (small) number of plants;
  - the preparation of the final questionnaire by the EIPPCB;
  - the distribution of the final questionnaire to the participating plants through the Member States' representatives;
  - the filling in of the questionnaire by the participating plants;
  - the collection of the filled-in questionnaires by the MS' representatives;
  - the quality check of the filled-in questionnaires by MS' representatives (possibly) with the help of a checklist developed by the TWG and EIPPCB;
  - the submission of the quality-checked questionnaires by the MS' representatives:
    - for the non-confidential version: submission to the TWG via BATIS;
    - for the confidential version: submission to the EIPPCB via email.
- The TWG to decide on the content and format of the questionnaire during the preparation of the questionnaire as described above.
- To collect data for the reference years 2019, 2018, 2017 and possibly 2020 and/or 2021 (if data are representative) or, if such data are not available, for the last 3 years for which data are available.

6.4 Confidentiality issues

In BP Section 2.3.2, the EIPPCB proposed the following:

- To design the questionnaire in a way that avoids requesting confidential data as much as possible so that all data provided by operators can be posted directly onto BATIS by Member States' representatives and thus shared with the whole TWG.
- The TWG to decide at a later stage (i.e. during the questionnaire development) about the type and format of potentially confidential information that needs to be collected.
- The Member States' representatives in the TWG to: i) submit the versions of the questionnaires containing the confidential information directly to the EIPPCB via email, and ii) post the versions of the questionnaires containing the non-confidential information onto BATIS.

The EIPPCB presented the principles for data collection and the treatment of confidentiality issues according to Sections 5.2-3 in the BREF Guidance; a presentation was given on the approach taken to analyse CBI in a closed web-based meeting for the review of the WGC BREF.

In the discussion, the EIPPCB highlighted that there is a well-established procedure to protect CBI. In the event that part of the data in the questionnaire is considered CBI, innovative solutions need to be explored to present such data in web-based meetings.

Industry associations suggested that data on production volumes and the consumption of energy and raw materials are confidential for all ceramic sectors, to protect the economic interests of operators. The environmental NGO suggested confidentiality of such data is to be discussed at the IED Forum or with the legal services of the European Commission; the environmental NGO requested access to CBI, like other TWG members. One Member State suggested that data on specific emissions (g pollutant/kg product) might be confidential and that such confidentiality issues could be addressed in the upcoming IED revision. Several participants cautioned against reporting aggregated data only (consumption, production, production capacities as stated in the permit), which may cause uncertainty and loss of information.

The TWG discussed CBI issues being addressed in more detail during the questionnaire development, which includes an exchange on how to treat/discuss CBI data in the CER BREF review process. It was suggested that the TWG should agree for each cell in the questionnaire whether data are CBI; a sound explanation and justification should be provided for all CBI cases and plant operators may decide which data they consider confidential. In this respect, the reference year of the collected data may be an important criterion as older data (e.g. >2 years old) may not be subject to the same confidentiality restrictions as more recent data.

The EIPPCB suggested that closed (web-based) sessions, following signed confidentiality agreements to protect the interest of plant operators, could be a way to communicate CBI within the TWG. A slightly revised proposal was presented, including a new bullet point on elaborating ways to discuss CBI data appropriately within the TWG. This modified proposal was adopted by the TWG.

Conclusions reached by the TWG:

- To design the questionnaire in a way that avoids requesting confidential data as much as possible so that all data provided by operators can be posted directly onto BATIS by Member States' representatives and shared with the whole TWG.
- The TWG to decide during the questionnaire development on the type and format of potentially confidential information that needs to be collected.
- The Member States' representatives in the TWG to:
  - submit the versions of the questionnaires containing the confidential information directly to the EIPPCB via email;
  - post the versions of the questionnaires containing the non-confidential information onto BATIS.
- In the event that certain data are considered confidential business information (CBI), the TWG to agree on specific measures (e.g. confidentiality agreements, approval of plant operators, code of conduct) on how data collected as CBI can be discussed and analysed, e.g. in closed physical and/or web-based TWG meetings.

6.5 CER BREF TWG subgroups

The BP did not propose to establish subgroups of the TWG. However, the environmental NGO proposed during the Welcome session on 28 October 2020 to establish two subgroups on: 1) circular economy and 2) decarbonisation. In the KoM, the EIPPCB presented general objectives and modalities of TWG subgroups as stipulated by the BREF Guidance.

In the discussion, the environmental NGO explained its proposal. Several MS expressed support but also concerns and asked to clarify formal aspects about the functioning of subgroups. MS also acknowledged the importance of decarbonisation and circularity but argued that these topics might be addressed by the TWG. Two industry associations did not see the necessity for subgroups as the proposed topics are to be covered by the data collection/questionnaire development; they proposed to postpone a decision to a later point, once the data collection is completed. Following additional clarification by the environmental NGO and the EIPPCB, a proposal was presented, which foresaw the establishment of two subgroups on: 1) decarbonisation and 2) circular economy, with the EIPPCB drawing up a mandate for both.

In the subsequent discussion, one Member State proposed to merge the two subgroups; another Member State and one industry association did not agree with the proposal. The EIPPCB took note of the reservations and asked the TWG to propose a possible way forward. Intensive discussions continued in which several Member States supported the establishment of subgroup(s). One industry association presented an alternative proposal to establish two subgroups on: 1) decarbonisation and circular economy and 2) data collection and questionnaire development – both to be coordinated by industry. The environmental NGO could agree to this proposal if one subgroup would be coordinated by them. Four MS expressed support for the establishment of two subgroups chaired by the EIPPCB.

The EIPPCB: 1) thanked the TWG for the constructive discussions, 2) proposed to adopt the proposal of the industry association with the modification that the two subgroups are led by the EIPPCB, 3) asked TWG members interested in participating in the subgroups to contact the EIPPCB via email, and 4) suggested that the mandates of the subgroups will be drafted by the EIPPCB in full transparency of the whole TWG in the weeks after the KoM.

Conclusions reached by the TWG:

- To establish two TWG subgroups on:
  - decarbonisation and circular economy issues;
  - data collection and questionnaire development,

  which both will be led by the EIPPCB.
- The EIPPCB to propose draft mandates to the TWG for those two subgroups.

By 26 March 2021:

- 51 TWG members (18 for MS, 29 for industry associations and 4 for an environmental NGO) and 1 observer had expressed their interest in participating in the subgroup on decarbonisation and circular economy issues;
- 43 TWG members (15 for Member States, 26 for industry associations and 2 for an environmental NGO) had expressed their interest in participating in the subgroup on data collection and questionnaire development.

6.6 Presentation from the University of Cambridge

A scientist from the University of Cambridge gave a presentation on 'Resource-efficient decision-making for industry', outlining an innovative approach to trace industrial energy and materials efficiency through an exergy analysis.

The presentation links to the establishment of a subgroup on decarbonisation and circular economy issues, to which the University of Cambridge could provide scientific insight and a fresh perspective as an observer.

6.7 Introduction to BATIS

The EIPPCB introduced BATIS - the Best Available Techniques Information System, which is a web-based software to facilitate the exchange of information for the CER BREF review. More specifically, BATIS is used to manage the list of CER TWG members and observers and to make available to the TWG all data and information collected in the review process.

The EIPPCB provided hands-on guidance on five BATIS features: 1) obtaining and changing login credentials, 2) reviewing and adapting personal information, 3) sending emails to TWG members and observers, 4) the structure of CER BREF folders, and 5) adding new posts, uploading and downloading documents.

The TWG was invited to contact the EIPPCB for technical questions or comments.

7 TECHNIQUES TO CONSIDER IN THE DETERMINATION OF BAT

7.1 Generic techniques in the ENE, EFS and ICS BREFs

In BP Section 3.5.1, the EIPPCB proposed to refer to 'horizontal' BREFs for generic techniques and include in the revised CER BREF only techniques that are specific to the ceramics industry. The proposal was not foreseen for discussion in the KoM; TWG members did not request to discuss it before or during the KoM and thus the EIPPCB proposal was adopted.

Conclusions reached by the TWG:

- To refer to 'horizontal' BREFs for generic techniques, namely:
  - the ENE BREF for generic techniques to increase energy efficiency;
  - the EFS BREF for generic techniques to reduce emissions from the storage, transfer and handling of materials;
  - the ICS BREF for generic techniques associated with indirect cooling with water;

  and to include in the CER BREF only techniques that are specific to the ceramic manufacturing industry.

7.2 Current CER BREF

In BP Section 3.5.2, the EIPPCB proposed to update and restructure the 2007 CER BREF with the aim to add BAT candidates, e.g. for the reuse and recycling of process waste water, waste/residues, and the reduction of noise. The proposal was not foreseen for discussion in the KoM; TWG members did not request to discuss it before or during the KoM. The EIPPCB proposal was adopted with one minor addition: For consistency, the word 'residues' was added after 'waste' in the second bullet point of the conclusions.

Conclusions reached by the TWG:

- To update and restructure Section 4.4 of the current CER BREF with the aim to add BAT candidates on the reuse and recycling of process waste water.
- To update and restructure Sections 4.5.2.1 and 4.5.2.2 of the current CER BREF with the aim to add BAT candidates on the reuse and recycling of waste/residues generated.
- To update and restructure Section 4.6 of the current CER BREF with the aim to add BAT candidates on the reduction of noise (including generic techniques).
- The TWG to provide information using the standard 10-heading template for all the other techniques that are not mentioned above but included in Chapter 4 of the current CER BREF.

7.3 Emerging techniques in the current CER BREF

In BP Section 3.5.3, the EIPPCB made a proposal on how to collect and update information on emerging techniques when reviewing the CER BREF. The proposal was not foreseen for discussion in the KoM and it was adopted.

Conclusions reached by the TWG:

- To take into account all the information provided for the drafting of the revised CER BREF.
- The TWG to provide information on these techniques using the standard 10-heading template.

7.4 Additional techniques

In BP Section 3.5.4, the EIPPCB made a proposal on how to collect and update information on additional techniques for the review of the CER BREF. The proposal was not foreseen for discussion in the KoM and it was adopted.

Conclusions reached by the TWG:

- To take into account the information provided for the drafting of the revised CER BREF.
- The TWG to provide information on these techniques using the standard 10-heading template.

8 NEXT STEPS TO BE TAKEN AFTER THE KICK-OFF MEETING

The EIPPCB presented a tentative timeline for the next steps of the CER BREF review. Two MS and one industry association asked for more time to complete and validate the questionnaire, specifying that there are for example several legal reporting obligations at the beginning of the year. One MS asked about the number of BREF drafts foreseen; the EIPPCB explained that there is only one formal draft foreseen for the review of the CER BREF. Following the discussion, the TWG agreed on the timeline shown in
Table 6 and Figure 1.

Table 6: Next steps - tentative timeline of the CER BREF review

Steps	Targeted time
EIPPCB to draft a mandate for the two TWG subgroups	Mid-March 2021
EIPPCB to issue the first draft questionnaire template	Mid-April 2021
Feedback of TWG subgroups on the first draft questionnaire	End May 2021
EIPPCB to issue the second draft questionnaire	End June 2021
TWG to provide proposals for well-performing plants for the data collection through plant-specific questionnaires	End June 2021
Feedback of TWG subgroups on the second draft questionnaire	Mid-September 2021
Collection of bulk information (e.g. information on applied processes and techniques, techniques to consider for the determination of BAT, emerging techniques)	End September 2021
TWG workshop on the finalisation of the questionnaire	Mid-October 2021
EIPPCB to compile the list of well-performing plants and to check its completeness; if necessary, EIPPCB to ask TWG members to amend/complete the list	Mid-October 2021
EIPPCB to issue the third draft questionnaire for testing	Mid-November 2021
Deadline for questionnaire testing	Early December 2021
EIPPCB to issue the final questionnaire; distribution to the participating plants	End December 2021
Submission of filled-in and quality-checked questionnaires (to BATIS/via email)	End April 2022
First data assessment workshop	Early September 2022
First formal draft of the revised CER BREF	4th Quarter 2022
TWG comments on CER BREF Draft 1	1st Quarter 2023
Second data assessment workshop	2nd Quarter 2023
Final TWG meeting	3rd-4th Quarter 2023
Final draft of the revised CER BREF delivered to the IED Article 13 Forum	2nd Quarter 2024
Voting of BAT conclusions by IED Article 75 Committee	4th Quarter 2024
Publication of the BAT conclusions in the Official Journal of the European Union	2nd Quarter 2025
Publication of the BREF on the EIPPCB website	2nd Quarter 2025

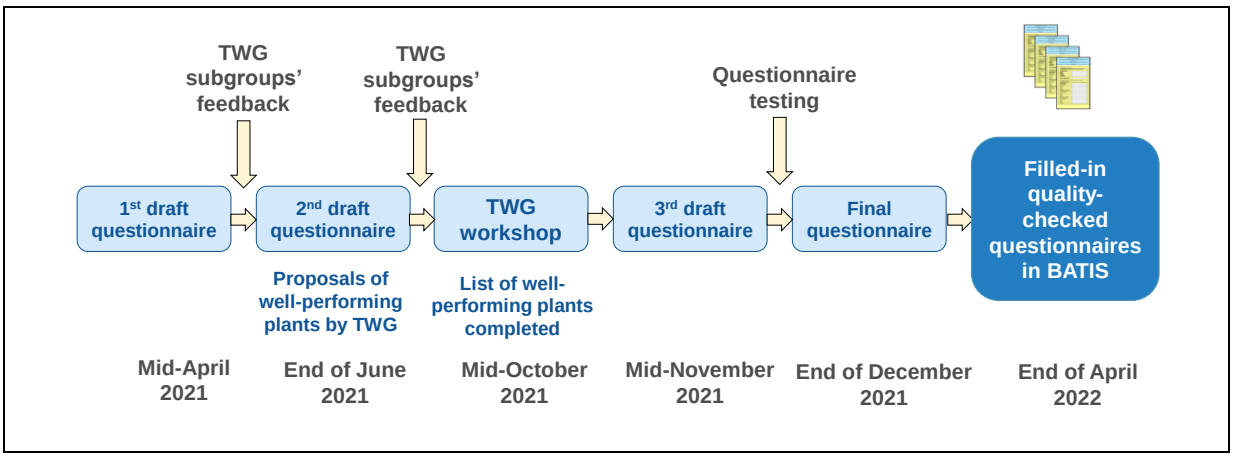

Figure 1: Next steps – tentative timeline of the data collection for the CER BREF review

8.1 Site visits

The EIPPCB explained the objectives and modalities of site visits according to Section 4.4.4 of the BREF Guidance. Site visits constitute an important part of the CER BREF review. They provide insight into the production/techniques of the ceramic sectors covered in the CER BREF; visited sites should also participate in the data collection.

One MS and one industrial association expressed interest in exploring the feasibility of organising site visits; another MS and another industrial association asked about experience with virtual site visits for the WGC BREF. The EIPPCB highlighted positive experience with virtual site visits but expressed a clear preference for physical site visits for the CER BREF review.

The EIPPCB invites proposals for site visits before summer 2021 and plans to organise site visits when the Covid-19 situation has improved.

ANNEX I: STANDARD STRUCTURE FOR DESCRIBING 'TECHNIQUES TO CONSIDER IN THE DETERMINATION OF BAT'

When providing information on 'Techniques to consider in the determination of BAT', a standard structure has to be used. This allows the assessment of techniques and the determination of BAT in an objective manner based on the definitions in the IED. The standard structure will be followed in the CER BREF and is stipulated by the BREF Guidance in Commission Implementing Decision 2012/119/EU (for details, see Table A1 below).

Table A1: Standard structure for describing 'Techniques to consider in the determination of BAT' (so-called BAT candidate techniques)

Type of information	Description of the information to be included in the BREF	Important information to collect and to report
Description	A brief description of the technique with a view to being used in the BAT conclusions.	
Technical description	A detailed and concise technical description of the technique (including chemical or other equations, pictures, diagrams and flow charts when appropriate).	The description can include both prevention and control techniques (in-process and end-of-pipe).
Achieved environmental benefits	The main potential environmental benefits (including reduced consumption of energy, reduced emissions to water, air and land, raw material savings as well as production yield increases, reduced waste, etc.) to be gained through implementing the technique.	
Environmental performance and operational data	Actual plant-specific performance data (including consumption and emission levels, consumption levels – of raw materials, water, energy – amounts of residues/wastes generated, including reference conditions – e.g. O_2 level – and monitoring methods used) achievable applying the technique. Any other information on how to design, operate, maintain and control the technique.	Emission data: • Both the concentration and (specific) load of pollutant(s) (if available) or the data needed to derive this information. For specific load data, the product referred to should be clearly defined. • The quantity of the pollutant before and after the abatement system in order to determine the abatement efficiency. • Details of relevant operating conditions (percentage of full capacity, fuel composition, bypassing of the abatement technique, inclusion or exclusion of other than normal operating conditions, reference conditions). • Emission monitoring issues (including information on frequency, averaging period, uncertainties, plant operating condition, etc.). Consumption data: • The type and amount of fuel, energy (heat, electricity), water and raw materials/chemicals consumed/used by the technique. Waste: • The type and quantities of waste generated and treatment/disposal methods and/or techniques to prevent waste. Others: • Sensitivity and durability of the technique. • Operation/control/maintenance issues. • Issues regarding accident prevention.

Type of information	Description of the information to be included in the BREF	Important information to collect and to report
Cross-media effects	Relevant negative environmental effects due to implementing the technique, allowing a comparison amongst techniques in order to assess the impact on the environment as a whole (such as consumption and nature of raw materials and water, energy consumption and contribution to climate change, stratospheric ozone depletion potential, photochemical ozone creation potential, acidification resulting from emissions to air, particulate matter in ambient air (including microparticles and metals), eutrophication of land and waters resulting from emissions to air or water, oxygen depletion potential in water, persistent/toxic/bioaccumulable components (including metals), generation of residues/waste, limitation of the ability to reuse or recycle residues/waste, generation of noise and/or odour, increased risk of accidents.	The Reference Document on Economics and Cross-media Effects (ECM) is a document that should be taken into account with regard to cross-media aspects as far as there are significant cross-media effects. This document is available from the European IPPC Bureau website at http://eippcb.jrc.ec.europa.eu/reference/BREF/ecm_bref_0706.pdf
Technical considerations relevant to applicability	Indication as to whether the technique can be applied throughout the sector; otherwise, information on the main general technical restrictions on the use of the technique (including an indication of the type of plants or processes within the sector to which the technique cannot be applied, and constraints to implementation).	
Economics	Information on costs (both investment and operational) and possible savings, including details on how these costs have been calculated	• Capital/investment, operating and maintenance costs including details on how these costs/savings have been calculated/estimated. • Possible savings (including payback time), including details on how these costs/savings have been calculated/estimated. • Cost data will preferably be given in euros (EUR). If a conversion is made from another currency, the data in the original currency and the year when the data were collected will be indicated. This is important as conversion rates vary over time. • Price/cost of equipment or service will be accompanied by the year it was purchased. • Information relevant to both new and existing plants enabling, where possible, the determination of the economic viability of the technique for the sector concerned. • Information on the cost-effectiveness of the technique (e.g. in EUR per abated mass of pollutant), where relevant. The Reference Document on Economics and Cross-media Effects (ECM) and the JRC Reference Report on Monitoring of Emissions to Air and Water from IED Installations (ROM) should be taken into account with regard to economic aspects and monitoring costs, respectively. Both documents are available from the European IPPC Bureau website at http://eippcb.jrc.ec.europa.eu/reference/
Driving force for implementation	Local conditions or requirements (e.g. legislation, safety measures) or non-environmental triggers (e.g. increased yield, improved product quality, economic incentives) which drive or may stimulate implementation. Information on reasons other than environmental ones for implementation.	Examples: • information on type/quality of receiving waters (e.g. temperature, salinity); • information on environmental quality standards; • information on the increase of production or productivity.
Example plants	Reference to plants in which the technique is implemented and from which information has been collected and used in writing the section, including an indication of the degree to which the technique is in use in the EU or worldwide.	
Reference literature	Literature or other reference material that was used in writing the section and that contains more detailed information. When the reference material consists of a large number of pages, reference will be made to the relevant page(s) or section(s).	