



**Annex 6**

**GUIDANCE ON CRITERIA FOR BASELINE SETTING AND MONITORING**



## GUIDANCE ON CRITERIA FOR BASELINE SETTING AND MONITORING

### Version 01

#### A. Background

1. The annex to decision 9/CMP.1 (hereinafter referred to as JI guidelines) includes an appendix B that lists criteria for baseline setting and monitoring.
2. According to paragraph 28 of the JI guidelines a Party hosting a joint implementation (JI) project shall make publicly available, directly or through the secretariat, information on the project in accordance with the reporting guidelines set out in appendix B of the JI guidelines and the requirements contained in decision 13/CMP.1.
3. Paragraphs 30–45 of the JI guidelines define the verification procedure under the Joint Implementation Supervisory Committee (JISC) (hereinafter referred to as the Track 2 procedure). The Track 2 procedure is the determination by an independent entity, accredited pursuant to appendix A of the JI guidelines, of whether a project and the ensuing reductions of anthropogenic emissions by sources or enhancements of anthropogenic removals by sinks meet the relevant requirements of Article 6 of the Kyoto Protocol and the JI guidelines. Under the Track 2 procedure, according to paragraphs 31 (c), 33 (b) and (c) and 37 of the JI guidelines, the accredited independent entity (AIE) shall:
  - (a) Receive from the project participants a project design document (PDD) that contains all information needed for the determination of whether the project has an appropriate baseline and monitoring plan in accordance with the criteria set out in appendix B of the JI guidelines;
  - (b) Determine whether the project would result in a reduction of anthropogenic emissions by sources or an enhancement of anthropogenic removals by sinks that is additional to any that would otherwise occur and has an appropriate baseline and monitoring plan in accordance with the criteria set out in appendix B of the JI guidelines;
  - (c) Make, upon receipt of a report referred to under paragraph 36 of the JI guidelines, a determination of the reductions in anthropogenic emissions by sources or enhancements of anthropogenic removals by sinks reported by project participants in accordance with appendix B of the JI guidelines, provided that they were monitored and calculated in accordance with paragraph 33 of the JI guidelines.
4. According to paragraph 2 (f) of decision 10/CMP.1 the JISC shall develop, as soon as possible, guidance with regard to appendix B of the JI guidelines, including provisions for small-scale projects as defined in paragraph 6 (c) of decision 17/CP.7, as appropriate.
5. Moreover, according to paragraph 3 (d) of the JI guidelines, the JISC shall also be responsible for the review and revision of reporting guidelines and criteria for baselines and monitoring in appendix B of the JI guidelines, for consideration by the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (COP/MOP), giving consideration to relevant work of the Executive Board of the clean development mechanism (CDM Executive Board), as appropriate.
6. The present document provides guidance on the criteria for baseline setting and monitoring contained in appendix B of the JI guidelines as well as related matters. The review and revision referred to in paragraph 3 (d) of the JI guidelines may be considered by the JISC at a later stage.



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7. This document takes up the general provisions contained in appendix B of the JI guidelines on criteria for baseline setting in section B. 1. below and on monitoring in section C. 1. below and elaborates on them in the specific context. When preparing a project design document (PDD) for a JI project the present document shall be taken into account in addition to the guidelines for users of the relevant JI PDD form.
8. A JI project is a project aimed at:
- (a) Reducing anthropogenic emissions by sources of greenhouse gases (GHGs); or
  - (b) Enhancing net anthropogenic removals by sinks of GHGs (hereinafter referred to as JI LULUCF project). According to decision 9/CMP.1, paragraph 4, JI LULUCF projects shall conform to definitions, accounting rules, modalities and guidelines under Article 3, paragraphs 3 and 4, of the Kyoto Protocol. Decision 16/CMP.1, paragraph 2, states that good practice guidance, and methods to estimate, measure, monitor and report changes in carbon stocks and anthropogenic GHG emissions by sources and removals by sinks resulting from land use, land-use change and forestry (LULUCF) activities, as developed by the Intergovernmental Panel on Climate Change (IPCC), shall be applied by Parties, if decided in accordance with relevant decisions of the COP/MOP. According to decision 17/CMP.1, paragraph 1, Parties included in Annex I to the Convention that have ratified the Kyoto Protocol shall apply for the first commitment period the good practice guidance for LULUCF, as developed by the IPCC.
9. The JISC will review this document periodically.



## **B. Guidance on criteria for baseline setting**

### **1. Background**

10. Paragraphs 1–3 of appendix B of the JI guidelines define criteria for baseline setting:
- (a) The baseline for a JI project is the scenario that reasonably represents the anthropogenic emissions by sources or anthropogenic removals by sinks of GHGs that would occur in the absence of the proposed project. A baseline shall cover emissions from all gases, sectors and source categories listed in Annex A of the Kyoto Protocol, and anthropogenic removals by sinks, within the project boundary;
  - (b) A baseline shall be established:
    - (i) On a project-specific basis and/or using a multi-project emission factor;
    - (ii) In a transparent manner with regard to the choice of approaches, assumptions, methodologies, parameters, data sources and key factors;
    - (iii) Taking into account relevant national and/or sectoral policies and circumstances, such as sectoral reform initiatives, local fuel availability, power sector expansion plans, and the economic situation in the project sector;
    - (iv) In such a way that emission reduction units (ERUs) cannot be earned for decreases in activity levels outside the project activity or due to force majeure;
    - (v) Taking account of uncertainties and using conservative assumptions;
  - (c) Project participants shall justify their choice of baseline.

### **2. Elements of joint implementation relevant for baseline setting**

11. In the case of a JI project aimed at reducing emissions, the project boundary shall:
- (a) Encompass all anthropogenic emissions by sources of GHGs which are:
    - (i) Under the control of the project participants;
    - (ii) Reasonably attributable to the project; and
    - (iii) Significant, i.e., as a rule of thumb, would by each source account on average per year over the crediting period for more than 1 per cent of the annual average anthropogenic emissions by sources of GHGs, or exceed an amount of 2,000 tonnes of CO<sub>2</sub> equivalent, whichever is lower; and
  - (b) Be defined on the basis of a case-by-case assessment with regard to the criteria referred to in subparagraph (a) above. If an approved CDM baseline and monitoring methodology is used the project boundary shall be defined in line with the approved methodology.

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12. In the case of a JI LULUCF project, the project boundary shall:
- (a) Geographically delineate the JI LULUCF project under the control of the project participants. A JI LULUCF project may contain more than one discrete area of land. In this case:
    - (i) Each discrete area of land should have a unique geographical identification;
    - (ii) The boundary should be defined for each discrete area and should not include the areas in between these discrete areas of land;
  - (b) Encompass all anthropogenic emissions by sources and removals by sinks of GHGs which are:
    - (i) Under the control of the project participants;
    - (ii) Reasonably attributable to the project; and
    - (iii) Significant;
  - (c) Account for all changes in the following carbon pools: above-ground biomass, below-ground biomass, litter, dead wood, and soil organic carbon. Project participants may choose not to account for one or more carbon pools if they provide transparent and verifiable information that indicates that the pool is not a source;
  - (d) Be defined on the basis of a case-by-case assessment with regard to the criteria referred to in subparagraph (b) above. If an approved CDM baseline and monitoring methodology is used the project boundary shall be defined in line with the approved methodology.
13. The delineation of the project boundary and the gases and sources/sinks included shall be described and justified in the relevant JI PDD. It is encouraged to use a figure or flow chart. All gases and sources/sinks included should be explicitly stated. Exclusions of any sources/sinks related to the baseline or the project shall be justified.
14. Leakage is the net change of anthropogenic emissions by sources and/or removals by sinks of GHGs which occurs outside the project boundary, and that can be measured and is directly attributable to the JI project. In the case of JI LULUCF projects, only the increased anthropogenic emissions by sources and/or reduced anthropogenic removals by sinks of GHGs outside the project boundary shall be taken into account.
15. Project participants must undertake an assessment of the potential leakage of the proposed JI project and explain which sources of leakage are to be calculated, and which can be neglected. Leakage to be included shall be quantified and a procedure provided for an ex ante estimate.
16. Projects starting as of 2000 may be eligible as JI projects if they meet the requirements of the JI guidelines. ERUs shall only be issued for a crediting period starting after the beginning of 2008. The project participants shall choose the starting date of the crediting period to be on or after the date the first emission reductions or enhancements of net removals are generated by the JI project. The crediting period shall not extend beyond the operational lifetime of the project. The crediting period can extend beyond 2012 subject to the approval by the host Party. The status of emission reductions or enhancements of net removals generated by JI projects after the end of the first commitment period may be determined by any relevant agreement under the UNFCCC.



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### 3. Basic features of a baseline

17. The baseline for a JI project:

- (a) Is the scenario that reasonably represents the anthropogenic emissions by sources or net anthropogenic removals by sinks of GHGs that would occur in the absence of the project;
- (b) Shall cover emissions from all gases, sectors and source categories listed in Annex A of the Kyoto Protocol, and/or anthropogenic removals by sinks, within the project boundary.

### 4. Basic options for the establishment of a baseline

18. A baseline shall be established on a project-specific basis and/or using a multi-project emission factor, taking into account the project boundary and in particular paragraph 26 below.

19. A multi-project emission factor may be used and its application shall be justified. Sector-wide baselines may e.g. be used if:

- (a) The physical characteristics of the sector justify the application of a standard emission factor across the sector (e.g. in the case of an integrated electricity network with no major transmission constraints, the physical characteristics of the system may imply that the impact of a project on emissions can be assessed irrespective of its location); and/or
- (b) The emissions intensity does not vary significantly across the sector (e.g. in the case of diesel power generation in off-grid electricity systems, the emission factor for electricity generation may be based on standard factors with a reasonable degree of accuracy).

20. The following two options are applicable if a baseline is established on a project-specific basis:

- (a) According to decision 10/CMP.1, paragraph 4 (a), project participants may apply methodologies for baselines and monitoring approved by the CDM Executive Board, including methodologies for small-scale project activities, as appropriate. If an approved CDM baseline and monitoring methodology is used, all explanations, descriptions and analyses shall be made in accordance with the selected methodology;
- (b) Alternatively, the project participants may establish a baseline that is in accordance with appendix B of the JI guidelines. In doing so, selected elements or combinations of approved CDM baseline and monitoring methodologies or approved CDM methodological tools may be used, as appropriate.

### 5. Identification of a baseline

21. Taking into account the options for the establishment of a baseline referred to in section 4. above, a baseline can be identified, inter alia:

- (a) By using an approved CDM baseline and monitoring methodology. In this case all explanations, descriptions and analyses, inter alia with regard to the identification of a baseline, shall be made in accordance with the methodology chosen;
- (b) By identifying and listing plausible future scenarios on the basis of conservative assumptions and identifying the most plausible one.

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22. A baseline shall be established taking into account relevant national and/or sectoral policies and circumstances, such as sectoral reform initiatives, local fuel availability, power sector expansion plans, and the economic situation in the project sector. Key factors that affect a baseline shall be taken into account, e.g.:

- (a) Sectoral reform policies and legislation;
- (b) Economic situation/growth and socio-demographic factors in the relevant sector as well as resulting predicted demand. Suppressed and/or increasing demand that will be met by the project can be considered in the baseline as appropriate (e.g. by assuming that the same level of service as in the project scenario would be offered in the baseline scenario);
- (c) Availability of capital (including investment barriers);
- (d) Local availability of technologies, skills and know-how and availability of best available technologies in the future;
- (e) Fuel prices and availability;
- (f) National and/or subnational expansion plans for the energy sector, as appropriate;
- (g) National and/or subnational forestry or agricultural policies, as appropriate.

23. Furthermore, each baseline shall be established:

- (a) In a transparent manner with regard to the choice of approaches, assumptions, methodologies, parameters, data sources and key factors;
- (b) Taking account of uncertainties and using conservative assumptions; and
- (c) In such a way that ERUs cannot be earned for decreases in activity levels outside the project activity or due to force majeure.

24. In establishing a baseline the project participants shall draw on the list of standard variables contained in appendix B to this document, as appropriate.

25. The project participants shall justify their choice of baseline taking into account annex 1 to this document. If the baseline approach chosen differs from approaches already taken in comparable cases (same GHG mitigation measure, same country, similar technology, similar scale) that an AIE has positively determined, the differences shall be explained and justified.

26. In any case:

- (a) The project participants shall set a baseline in accordance with appendix B of the JI guidelines;
- (b) The host Party/Parties (as well as the other Parties involved) has/have to approve the project; and
- (c) The AIE has to determine whether the project has an appropriate baseline in accordance with the criteria set out in appendix B of the JI guidelines.



### C. Guidance on monitoring

#### 1. Background

27. Paragraphs 4–6 of appendix B of the JI guidelines contain regulations with regard to monitoring:
- (a) Project participants shall include, as part of the PDD, a monitoring plan that provides for:
    - (i) The collection and archiving of all relevant data necessary for estimating or measuring anthropogenic emissions by sources and/or anthropogenic removals by sinks of GHGs occurring within the project boundary during the crediting period;
    - (ii) The collection and archiving of all relevant data necessary for determining the baseline of anthropogenic emissions by sources and/or anthropogenic removals by sinks of GHGs within the project boundary during the crediting period;
    - (iii) The identification of all potential sources of, and the collection and archiving of data on increased anthropogenic emissions by sources and/or reduced anthropogenic removals by sinks of GHGs outside the project boundary that are significant and reasonably attributable to the project during the crediting period. The project boundary shall encompass all anthropogenic emissions by sources and/or removals by sinks of GHGs under the control of the project participants that are significant and reasonably attributable to the JI project;
    - (iv) The collection and archiving of information on environmental impacts, in accordance with procedures as required by the host Party, where applicable;
    - (v) Quality assurance and control procedures for the monitoring process;
    - (vi) Procedures for the periodic calculation of the reductions of anthropogenic emissions by sources and/or enhancements of anthropogenic removals by sinks by the proposed JI project, and for leakage effects, if any. Leakage is defined as the net change of anthropogenic emissions by sources and/or removals by sinks of GHGs which occurs outside the project boundary, and that is measurable and attributable to the JI project;
    - (vii) Documentation of all steps involved in the calculations referred to in paragraphs 4 (b) and (f) of appendix B of the JI guidelines;
  - (b) Revisions, if any, to the monitoring plan to improve its accuracy and/or completeness of information shall be justified by project participants and shall be submitted for the determination referred to in paragraph 37 of the JI guidelines by the AIE;
  - (c) The implementation of the monitoring plan and its revisions, as applicable, shall be a condition for verification.



## 2. Monitoring

28. As part of the PDD of the project a monitoring plan has to be established by the project participants in accordance with appendix B of the JI guidelines:
- (a) According to decision 10/CMP.1, paragraph 4 (a), project participants may apply methodologies for baselines and monitoring approved by the CDM Executive Board, including methodologies for small-scale project activities, as appropriate. If an approved CDM baseline and monitoring methodology is used, all explanations, descriptions and analyses shall be made in accordance with the selected methodology;
  - (b) In other cases, a monitoring plan established in accordance with appendix B of the JI guidelines may, inter alia, use selected elements or combinations of approved CDM baseline and monitoring methodologies, if deemed appropriate.
29. The monitoring plan shall, inter alia:
- (a) Describe all relevant factors and key characteristics that will be monitored, and the period in which they will be monitored, in particular also all decisive factors for the control and reporting of project performance;
  - (b) Specify the indicators, constants and variables used taking into account paragraph 30 below;
  - (c) Draw on the list of standard variables contained in appendix B to this document, as appropriate;
  - (d) Describe the methods employed for data monitoring (including its frequency) and recording;
  - (e) Present the quality assurance and control procedures for the monitoring process. This includes, as appropriate, information on calibration and on how records on data and/or method validity and accuracy are kept and made available on request;
  - (f) Clearly identify the responsibilities and the authority regarding the monitoring activities;
  - (g) On the whole, reflect good monitoring practices appropriate to the project type. In the case of JI LULUCF projects, this includes applying the good practice guidance, as developed by the IPCC; and
  - (h) Provide a complete compilation of the data that needs to be collected for its application. This includes data that is measured or sampled and data that is collected from other sources (e.g. official statistics, expert judgment, proprietary data, IPCC, commercial and scientific literature etc.). Data that is calculated with equations should not be included in the compilation. The information in the monitoring plan shall be provided in tabular form.

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30. The indicators, constants, variables and/or models used shall be reliable (i.e. provide consistent and accurate values) and valid (i.e. be clearly connected with the effect to be measured), and shall provide a transparent picture of the emission reductions or enhancements of net removals (to be) monitored. In particular, it is recommended with regard to:

- (a) Project-specific indicators to use, to the extent possible, indicators that are already used in normal business practice and/or have to be reported e.g. to local authorities. Such indicators might also be used to cross-check project operations (e.g. changes in the ratio of fuel input and energy output could indicate that the project equipment is not working properly and leakage effects have occurred);
- (b) Leakage indicators to use data from suppliers/utilities and/or available public statistics and/or to conduct surveys, as business-linked indicators might not be available and leakage effects can be controlled less effectively by the project participants.

Default values, may be used, as appropriate. In the selection of default values, accuracy and reasonableness shall be carefully balanced. The default values chosen should originate from recognized sources, be supported by statistical analyses providing reasonable confidence levels and be presented in a transparent manner.

31. Emission reductions or enhancements of net removals shall be estimated/calculated in accordance with annex 2 below.

32. If a national or international monitoring standard has to be and/or is applied to monitor certain aspects of the project, this standard shall be identified and a reference as to where a detailed description of the standard can be found shall be provided. Whenever possible, internationally recognized standards/methods with regard to monitoring (as well as calibration, as appropriate) should be applied.

33. In any case:

- (a) The project participants shall set a monitoring plan in accordance with appendix B of the JI guidelines, in particular covering the criteria listed in paragraph 27 (a) above;
- (b) The host Party/Parties (as well as the other Parties involved) has/have to approve the project; and
- (c) The AIE has to determine whether the project has an appropriate monitoring plan in accordance with the criteria set out in appendix B of the JI guidelines.

34. Project participants shall ensure that monitoring occurs in accordance with the monitoring plan.

35. If statistical techniques are used for monitoring, these shall be documented and used in a conservative manner.

36. In accordance with paragraph 36 of the JI guidelines, project participants shall submit to an AIE a monitoring report on reductions in anthropogenic emissions by sources or enhancements of net anthropogenic removals by sinks that have already occurred. This report will be made publicly available.



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37. The project participants are encouraged to improve the monitoring process and its results. Revisions, if any, to the monitoring plan to improve its accuracy and/or completeness of information shall be justified by project participants and shall be submitted for the determination referred to in paragraph 37 of the JI guidelines by the AIE. In this case the AIE shall determine whether the proposed revisions improve the accuracy and/or completeness of information of the original monitoring plan without changing conformity with the relevant rules and regulations for the establishment of monitoring plans and, in case of a positive determination, shall proceed with the determination referred to in paragraph 37 of the JI guidelines.

38. Data monitored and required for determination according to paragraph 37 of the JI guidelines are to be kept for two years after the last transfer of ERUs for the project.



## ANNEX 1

**Additionality**

1. In accordance with Article 6 of the Kyoto Protocol a joint implementation project has to provide a reduction in emissions by sources, or an enhancement of net removals by sinks, that is additional to any that would otherwise occur.
2. Having identified a baseline, additionality can be demonstrated, inter alia, by using one of the following approaches:
  - (a) In case an approved clean development mechanism (CDM) baseline and monitoring methodology is used, all explanations, descriptions and analyses, inter alia with regard to additionality, shall be made in accordance with the selected methodology;
  - (b) In all other cases, inter alia, one of the following options may be applied:
    - (i) Application of the most recent version of the “Tool for the demonstration and assessment of additionality” approved by the CDM Executive Board;
    - (ii) Application of any other method for proving additionality approved by the CDM Executive Board;
    - (iii) Provision of traceable and transparent information showing that the baseline was identified on the basis of conservative assumptions, that the project scenario is not part of the identified baseline scenario and that the project will lead to reductions of anthropogenic emissions by sources or enhancements of net anthropogenic removals by sinks of GHGs;
    - (iv) Provision of traceable and transparent information that an accredited independent entity has already positively determined that a comparable project (to be) implemented under comparable circumstances (same GHG mitigation measure, same country, similar technology, similar scale) would result in a reduction of anthropogenic emissions by sources or an enhancement of net anthropogenic removals by sinks that is additional to any that would otherwise occur and a justification why this determination is relevant for the project at hand.

The approach chosen, including its appropriateness, shall be justified as a basis for the determination referred to in paragraph 33 of the annex to decision 9/CMP.1 on guidelines for the implementation of Article 6 of the Kyoto Protocol.

## ANNEX 2

**Calculation of emission reductions or enhancements of net removals**

1. The emission reductions or enhancements of net removals generated by the project have to be estimated ex ante in the project design document (PDD) of the project and calculated ex post according to the monitoring plan included in the PDD:
  - (a) On a periodic basis;
  - (b) At least from the beginning until the end of the crediting period;
  - (c) On a source-by-source/sink-by-sink basis;
  - (d) In tonnes of CO<sub>2</sub> equivalent, using global warming potentials defined by decision 2/CP.3 or as subsequently revised in accordance with Article 5 of the Kyoto Protocol.
  
2. Reductions of anthropogenic emissions by sources or enhancements of net anthropogenic removals by sinks of greenhouse gases (GHGs) generated by joint implementation (JI) projects are estimated/calculated by comparing the quantified anthropogenic emissions by sources or net anthropogenic removals by sinks within the project boundary in the baseline scenario with those in the project scenario and adjusting for leakage. In practice, this estimation/calculation can be conducted, as appropriate, in one of the following two ways:
  - (a) Assessment of emissions or net removals in the baseline scenario and in the project scenario:
    - (i) Estimation/calculation of anthropogenic emissions by sources or net anthropogenic removals by sinks within the project boundary in the baseline scenario;
    - (ii) Estimation/calculation of anthropogenic emissions by sources or net anthropogenic removals by sinks within the project boundary in the project scenario;
    - (iii) Difference of the results of the estimations/calculations referred to in subparagraphs (i) and (ii) above;
    - (iv) Adjustment of the result of subparagraph (iii) above for leakage;
  - (b) Direct assessment of emission reductions:
    - (i) Direct estimation/calculation of the difference between the anthropogenic emissions by sources within the project boundary in the baseline scenario and in the project scenario (e.g. in the case of landfill gas projects, the emission reductions can be calculated by multiplying the methane captured with an appropriate factor based on the global warming potential of methane);
    - (ii) Adjustment of the result of subparagraph (i) above for leakage.
  
3. The project boundary chosen affects the identification of sources/sinks for which emissions or net removals have to be assessed when estimating/calculating reductions of anthropogenic emissions by sources or enhancements of net anthropogenic removals by sinks of GHGs.



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4. A number of key factors, e.g. those referred to in paragraph 22 on page 6 of this document as well as project-specific factors such as operation mode and/or technical performance, influence:

- (a) The baseline scenario and the baseline emissions or net removals; and
- (b) The activity level of the project and the emissions or net removals as well as risks associated with the project;

and should therefore be taken into account, as appropriate, not only when establishing a baseline, but also when estimating/calculating the emission reductions or enhancements of net removals (to be) generated by the project.

5. Data sources used to define project and baseline scenarios, to assess leakage effects and to estimate/calculate emission reductions or enhancements of net removals shall be clearly identified, reliable and transparent.

6. In the estimations/calculations referred to in paragraph 2 above emission factors, including default emission factors, may be used, as appropriate. In the selection of emission factors, accuracy and reasonableness shall be carefully balanced. The choice of emission factors shall be justified.

7. The estimations/calculations referred to in paragraph 2 above shall, in particular, be based on conservative assumptions and the most plausible scenarios, and be conducted in a transparent manner. In this context the project participants may draw on appendix A to this document, as appropriate.

## APPENDIX A

**General guidance on estimations/calculations used in the baseline and the monitoring plan**

1. The project participants should:
  - (a) Elaborate all algorithms and formulae used. These should be specific and complete:
    - (i) The underlying rationale for the algorithms/formulae (e.g. marginal vs. average etc.) should be explained;
    - (ii) Consistent variables, equation formats, subscripts etc. should be used;
    - (iii) All equations should be numbered;
    - (iv) All variables, with units indicated, should be defined;
    - (v) The conservativeness of the algorithms/procedures should be justified. To the extent possible, methods to quantitatively account for uncertainty in key parameters should be included;
  - (b) Elaborate all parameters, coefficients, and variables used:
    - (i) For those values that are to be provided by the project participants, it should be clearly indicated how the values are to be selected and justified, for example, by explaining:
      - What types of sources are suitable (official statistics, expert judgment, proprietary data, IPCC, commercial and scientific literature etc.);
      - The vintage of data that is suitable (relative to the project's crediting period);
      - What spatial level of data is suitable (local, regional, national, international);
      - How conservativeness of the values is to be ensured;
    - (ii) For other values:
      - The precise references from which these values are taken should be clearly indicated (e.g. official statistics, IPCC Guidelines, commercial and scientific literature);
      - The conservativeness of the values provided should be justified;
  - (c) For all data sources, specify the procedures to be followed if expected data are unavailable. For instance, it could be pointed to a preferred data source (e.g. national statistics for the past 5 years), and indicated a priority order for use of additional data (e.g. using longer time series) and/or fall back data sources to preferred sources (e.g. private, international statistics etc.);
  - (d) Use International System Units (SI units);
  - (e) Note any parameters, coefficients, variables etc. that are used to calculate baseline emissions or net removals but are obtained through monitoring. Consistency between the baseline and monitoring plan should be ensured;



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- (f) If the calculation of the baseline emissions or net removals is to be performed ex post, include an illustrative ex ante emissions or net removals calculation;
- (g) Ensure consistency between the elaboration of the baseline scenario and the procedure for calculating the emissions or net removals of the baseline;
- (h) Explain any parts of the algorithms or formulae that are not self-evident. It should be justified that the procedure is consistent with standard technical procedures in the relevant sector. References should be provided as necessary. Implicit and explicit key assumptions should be explained in a transparent manner. It should be clearly stated which assumptions and procedures have significant uncertainty associated with them, and how such uncertainty is to be addressed. The uncertainty of key parameters should be described and, where possible, an uncertainty range at 95% confidence level for key parameters for the calculation of emission reductions or enhancements of net removals should be provided. Project participants are also encouraged to refer to chapter 6 of the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories for more guidance on analysis of uncertainty;
- (i) Elaborate the algorithms and formulae used to estimate, measure or calculate the emission reductions or enhancements of net removals from the JI project;
- (j) Even if the calculation of the emission reductions or enhancements of net removals is to be performed ex post, include the calculation of an ex ante estimate;
- (k) Ensure that the description of emission reductions or enhancements of net removals is consistent with the monitoring plan;
- (l) Taking into account that a baseline should be established in a transparent manner and using conservative assumptions, explicitly explain the assumptions and substantiate choices. In case of uncertainty regarding values of variables and parameters, the establishment of a baseline is considered conservative if the resulting projection of the baseline does not lead to an overestimation of emission reductions or enhancements of net removals attributable to the JI project.



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## APPENDIX B

List of standard variables

## 1. Emissions, emission factors and global warming potentials

Variable	Symbol	Units	Comment
Baseline emissions (total)	$BE_v$	tCO <sub>2</sub> e	
Component of baseline emissions	$BE_{XX,y}$	tCO <sub>2</sub> e	XX should be 2-3 letters or a word signifying the source of emissions (e.g. $BE_{LW,y}$ = baseline emission from land-filled waste)
Component and specific gas of baseline emissions	$BE_{GHG,XX,y}$	tCO <sub>2</sub> e	GHG should be gas name; XX should be 2-3 letters or a word signifying the source of emissions
Project emissions	$PE_v$	tCO <sub>2</sub> e	
Component of project emissions	$PE_{XX,y}$	tCO <sub>2</sub> e	XX should be 2-3 letters or a word signifying the source of emissions
Component and specific gas of project emissions	$PE_{GHG,XX,y}$	tCO <sub>2</sub> e	GHG should be gas name; XX should be 2-3 letters or a word signifying the source of emissions
Leakage emissions	$LE_v$	tCO <sub>2</sub> e	
Component of leakage emissions	$LE_{XX,y}$	tCO <sub>2</sub> e	XX should be 2-3 letters or a word signifying the source of emissions (e.g. $LE_{VH,y}$ = leakage emissions from vehicles)
Component and specific gas of leakage emissions	$LE_{GHG,XX,y}$	tCO <sub>2</sub> e	GHG should be gas name; XX should be 2-3 letters or a word signifying the source of emissions
Carbon dioxide emission factor	$EF_{CO_2,XX}$	tCO <sub>2</sub> /TJ	XX should refer to fuel type, and could be i to signify several possible fuel types (e.g. $EF_{CO_2,i}$ or $EF_{CO_2,coal}$ , $EF_{CO_2,NG}$ , $EF_{CO_2,oil}$ )
Methane emission factor	$EF_{CH_4,XX}$	tCH <sub>4</sub> /TJ	XX should refer to fuel type or process
Nitrous oxide emission factor	$EF_{N_2O,XX}$	tN <sub>2</sub> O/TJ	XX should refer to fuel type or process
Carbon dioxide equivalent emission factor	$EF_{CO_2e,XX}$	tCO <sub>2</sub> e/TJ	XX should refer to fuel type or process
CO <sub>2</sub> emission factor for electricity	$EF_{CO_2,ELEC,y}$	tCO <sub>2</sub> /MWh	
Global warming potential	$GWP_{XX}$	tCO <sub>2</sub> e/t gas	XX should denote the gas (CH <sub>4</sub> , N <sub>2</sub> O)
Other emission factors	$EF_{XX,YY}$	tGHG/unit of output	XX should specify the gas (where necessary), YY is product output or service (e.g. $EF_{CO_2,clinker}$ : emissions factor for clinker in tCO <sub>2</sub> /t clinker; $EF_{N_2O,NA}$ : emissions factor for nitric acid in tN <sub>2</sub> O/t nitric acid)

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## 2. General

Variable	Symbol	Units	Comment
Production output (project or baseline)	$P_{xx,zz,y}$	tonnes or $m^3$	XX indicates the product, y is year. ZZ represents baseline and project production of same product, if needed, use subscripts BL and PJ for baseline and project respectively (e.g. $P_{NH_3,PJ,y}$ = production of ammonia in the project activity)
Density	$\rho_x$	$t/m^3$	E.g. $\rho_{CH_4}$ = density of methane
Weight fraction or weight concentration	$w_{GHG,XX}$	volume or mass %	GHG is the gas; XX indicates where concentration sample is taken and/or substance measured (e.g. $w_{CH_4,PJ}$ = concentration of methane in project gas stream)
Flow rate	$FR_{XX,YY}$	$m^3/\text{time}$	XX should denote the gas, YY the type of flow stream (e.g. $FR_{CH_4,flare}$ )
Days	d	days	
Hour, year	h, y		

## 3. Energy

Variable	Symbol	Units	Comment
Energy efficiency	$\eta_{xx}$	%	Useful energy output/total energy input, also used for power plants and all boilers (e.g. $\eta_{BL}$ = energy efficiency of piece of equipment in the baseline)
Electricity generation	$EG_y$	MWh	Project and baseline generation should include subscripts (e.g. $EG_{PJ,y}$ )
Heat production	$HG_y$	GJ	Project and baseline generation should include subscripts (e.g. $HG_{BL,y}$ )
Electricity consumption	$EC_y$	MWh	
Heat consumption	$HC_y$	GJ	
Net calorific value	$NCV_{XX}$	GJ/t	XX is the fuel or oxidized substance; XX could be i if there are many alternatives; standardised to lower heating value (e.g. $NCV_{NG}$ = net calorific value of natural gas)
Fuel quantity combusted	$FC_{XX}$	t or $m^3$	XX is the fuel type (e.g. $FC_{Biomass}$ = quantity biomass combusted, $FC_{NG}$ = quantity natural gas combusted)
Oxidation factor for fuel combustion	$OXID_{XX}$	%	XX is the fuel type, e.g. $OXID_{NG}$ = oxidation factor for natural gas
Specific energy consumption	$SEC_{XX}$	GJ/tonne production	E.g. $SEC_{clinker}$ = energy consumption per tonne of clinker produced
Specific fuel consumption	$SFC_{XX}$	tonne fuel/tonne production	E.g. $SFC_{OPC}$ = fuel consumption per tonne of ordinary Portland cement production
Specific energy consumption in transport	$SEC_{YY,XX}$	GJ/t-km or passenger-km	YY is transport mode and XX is fuel

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Weighting of operating margin	$W_{OM}$	-	
Weighting of build margin	$W_{BM}$	-	
Electricity generated by plant $i$ on grid	$EG_{GRID,i,y}$	MWh	$i$ is plant, $y$ is year
Load factor	$LF_x$	%	$x$ is plant identification
Operating hours	$T_x$	hours	Annual operating hours for plant/equipment $x$
Enthalpy	$h$	kJ/kg	Used in particular for steam

 4. *Financial/economic*

Variable	Symbol	Units	Comment
Internal Rate of Return	IRR	%	
Discount rate	dr	%	
Net Present Value	NPV	\$ or LCU	

 5. *Agriculture, waste and fugitive methane emissions*

Variable	Symbol	Units	Comment
Methane gas destroyed in baseline	$GD_{CH_4,BL,y}$	tCH <sub>4</sub>	
Methane gas destroyed in project scenario	$GD_{CH_4,PJ,y}$	tCH <sub>4</sub>	
Flare efficiency	$\eta_{flare,t}$	%	This may have a time or period component $t$ , if efficiency is measured and varies over time
Fraction of methane destroyed in baseline	$FD_{CH_4,BL,y}$	%	Used if the baseline specifies a percentage rather than absolute baseline estimate
Methane Conversion Factor	MCF	%	For landfill site or wastewater treatment plant
Chemical oxygen demand	$COD_y$	t COD	For effluent stream
Biological oxygen demand	$BOD_{i,y}$	t BOD	$i$ is stage of treatment
Maximum methane production capacity	$B_0$	tCH <sub>4</sub> /t input	“input” could be COD, or mass of waste stream (e.g. manure)
Degradable Organic Carbon	$DOC_j$	Fraction	$j$ is part of waste stream (e.g. slow vs. fast degrading materials)
Fraction of DOC dissimilated	$DOC_F$	Fraction	
Methane conversion factor for treatment of manure	$MCF_{manure,i}$	%	$i$ is stage of treatment
Volatile solid excretion rate	$VS_p$	kg dry matter/animal-day	$p$ is the population targeted

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<b>Variable</b>	<b>Symbol</b>	<b>Units</b>	<b>Comment</b>
Weight fraction of CaO or MgO	$w_{CaO,x}$ / $w_{MgO,x}$	Fraction	x can indicate clinker or raw material