ARTICLE 6.4 MECHANISM

A6.4-STAN-METH-007

Standard

Addressing non-permanence and reversals in mechanism methodologies

Version 01.0

United Nations
Framework Convention on
Climate Change

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1. Introduction

1.1. Scope

1. This standard sets out the requirements for mechanism methodologies to address non-permanence and reversals. It will be applied by proponents of mechanism methodologies in developing methodologies and by the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, the Methodological Expert Panel (MEP) and the Supervisory Body in assessing and considering mechanism methodologies for approval.

1.2. Entry into force

2. This document enters into force on 10 October 2025.

2. Definitions

3. The following definitions shall apply:

   (a) **Active crediting period:** The first crediting period of an Article 6.4 activity and any subsequent crediting period that has been renewed;

   (b) **Avoidable reversals:** Reversals caused by factors over which the activity participants have influence or control;

   (c) **Carbon stock:** The quantity of carbon in a greenhouse gas reservoir;

   (d) **Crediting deficit:** A net increase in greenhouse gas emissions resulting from an Article 6.4 activity caused by factors other than reversals;[1]

   (e) **Greenhouse gas reservoir:** A component or components of the global climate system where a greenhouse gas or a precursor of a greenhouse gas is stored. For the purposes of the Article 6.4 mechanism, this term excludes the atmosphere and includes the biosphere, geosphere, and hydrosphere;

   (f) **Legal requirements:** Laws, statutes, regulations, court orders, decrees, consent agreements, executive orders, permitting conditions or any other legally binding mandates, noting that regulatory environments may vary;

   (g) **Negligible risk of reversal:** A risk of reversal that would result in a loss of no more than a maximum percentage to be specified in methodologies on the basis of guidance to be developed in the reversal risk assessment tool of all the A6.4ERs issued with respect to the total emission reductions and/or net removals achieved by the activity during its active crediting period,[2] calculated over a 100-year timeframe starting from no earlier than the end of the last active crediting period;

   (h) **Observed event:** An indication of any occurrence involving the release of stored greenhouse gases that could potentially lead to a reversal;

   (i) **Post-crediting monitoring period:** The period that follows the last active crediting period, during which time activity participants monitor greenhouse gas reservoirs for reversals and no A6.4ERs shall be generated;

[1] See section 6.4 of this standard.

[2] Consistent with section 6.3 of this standard.

(j) **Reversal:** A net loss in the storage of a greenhouse gas or a precursor of a greenhouse gas for which A6.4ERs have been issued, calculated across all applicable greenhouse gas reservoir(s) over a period of time covered by a monitoring report;

(k) **Reversal risk assessment tool:** A methodological tool that is used to determine the fraction of the total number of A6.4ERs to be contributed to the reversal risk buffer pool account and whether an activity faces a negligible risk of reversal;

(l) **Reversal risk buffer pool account:** A registry account, administered by the secretariat in its role as administrator of the Article 6.4 mechanism registry, from which A6.4ERs are cancelled to remediate reversals;[3]

(m) **Unavoidable reversals:** Reversals caused by factors over which the activity participants have no influence or control.

3. Applicability

4. This version of the standard is applicable to proposed mechanism methodologies for activities undertaken at the project level. The standard may be amended in the future to also cover methodologies addressing mitigation actions at other scales (e.g., programmes of activities, policies, sectoral approaches).

5. None of the types of activities or examples mentioned in paragraphs 6 and 7 below is intended to prejudice whether an activity or example is or should be eligible for registration under the Article 6.4 mechanism. They are listed only to clarify whether this standard would apply to the activity type if the Supervisory Body were to approve it for registration under the Article 6.4 mechanism.

6. The standard applies to mechanism methodologies for activities involving emission reductions with reversal risks and activities involving removals with reversal risks. This includes, but is not limited to the following types of activities:

(a) Activities increasing carbon stocks or reducing the loss of carbon stocks, relative to the baseline, in any of the greenhouse gas reservoirs of the biosphere;[4]

(b) Activities increasing the storage of greenhouse gases or precursors of greenhouse gases, relative to the baseline, in products or materials;[5]

(c) Activities increasing the storage of greenhouse gases or precursors of greenhouse gases, relative to the baseline, in geological reservoirs;[6]

[3] A6.4ERs contributions to the reversal risk buffer pool are to be considered as 'forwarded' without effecting a first transfer pending a future decision by the Supervisory Body.

[4] This includes, for example, afforestation, reduced deforestation, peatland rewetting, agricultural practices to enhance soil organic carbon, activities reducing the consumption of non-renewable biomass.

[5] This includes, for example, capture of carbon dioxide from the atmosphere and its storage in construction materials, such as concrete, or the storage of carbon in biochar or in harvested wood products.

[6] This includes, for example, capturing carbon dioxide from the atmosphere and storing it in a geological reservoir or capturing greenhouse gases from point sources (e.g., cement production plants, biomass combustion) and storing them in a geological reservoir.

(d) Activities accelerating, relative to the baseline, natural processes by which minerals react with carbon dioxide in the atmosphere and lock it away as carbonates;[7]

(e) Activities increasing, relative to the baseline, the capacity of the hydrosphere to store greenhouse gases or precursors of greenhouse gases;[8]

(f) Activities preventing the release of greenhouse gases from fossil fuels that in their natural deposits or during storage after extraction would, in the baseline scenario, interact with the atmosphere.[9]

7. The following types of activities are deemed not to be subject to reversal risks:

(a) Activities reducing the combustion of fossil fuels that, in their natural deposits or during storage after extraction, do not interact with the atmosphere;[10]

(b) Activities reducing greenhouse gases other than carbon dioxide through processes not related to storage in a greenhouse gas reservoir.[11]

4. General principles and requirements

4.1. Principles

8. The following principles shall be applied in the context of addressing reversals to ensure that information provided is a true and fair account. These principles shall be the basis for and guide the development of mechanism methodologies:

(a) **Relevance**: Data, parameters, assumptions, and methods used for addressing reversals shall not be misleading and only verifiable data and parameters that may have an impact on how reversals are addressed shall be included;

(b) **Completeness**: All relevant information to address reversals shall be provided;

(c) **Consistency**: The application of methods ensures consistent results across similar circumstances;

(d) **Accuracy**: Bias and uncertainties in both quantitative and non-quantitative information shall be reduced as far as it is practical;

(e) **Transparency**: Sufficient and appropriate information shall be disclosed to allow intended users to make decisions with reasonable confidence. Transparency relates to clearly stating all data, parameters, assumptions and methods applied; referencing background material; stating documentation changes; and stating and justifying all data, parameters, methods and assumptions made such that the outcomes can be reproduced.

[7] This includes, for example, enhanced weathering.

[8] This includes, for example, storing carbon dioxide in the water column of oceans or enhancing the alkalinity of oceans.

[9] This includes, for example, closing abandoned oil wells, extinguishing coal mine fires, or preventing fires from gas and oil wells.

[10] This includes, for example, renewable energy generation, energy efficiency improvements, and fossil fuel switching.

[11] This includes, for example, landfill gas capture and utilisation, abatement of nitrous oxide emissions from nitric acid production, reduction of N_2O emissions from fertilizer application, or reduction of methane emissions from rice cultivation or enteric fermentation.

4.2. General requirements

9. Mechanism methodologies shall ensure conservativeness in addressing reversals. This shall apply to all data, parameters, assumptions, and methods used in the analysis (e.g., assumptions made in the risk assessment). The degree of conservativeness shall be based on the overall level of uncertainty. All sources of uncertainty shall be considered, including uncertainty in data, parameters, assumptions, and methods.

10. Proponents of mechanism methodologies shall ensure that the provisions in mechanism methodologies to address reversals consider all national or sub-national policies, including legal requirements, that are applicable to the relevant Article 6.4 activity.

5. Identification of applicable greenhouse gas reservoirs

11. Mechanism methodologies shall identify all applicable greenhouse gas reservoirs:

    (a) That may be affected by Article 6.4 activities covered by that methodology; and

    (b) For which changes in the storage of a greenhouse gas or a precursor of a greenhouse gas are eligible for the issuance of A6.4ERs.

12. Mechanism methodologies shall require activity participants to apply the reversal risk assessment tool to the greenhouse gas reservoirs identified in paragraph 11 above to determine the fraction of the total number of A6.4ERs to be contributed to the reversal risk buffer pool account.

13. The proponents of a mechanism methodology may propose alternative approaches to the provisions listed in paragraph 15 below, if these alternative approaches ensure, with a high level of confidence, that reversals from Article 6.4 activities are fully remediated in the crediting period and post-crediting monitoring period and ensure that the alternative approaches do not cause instances of moral hazard.[12] These approaches may only be proposed if all of the following conditions are satisfied for the applicable greenhouse gas reservoir:

    (a) That activity participants using the mechanism methodology have no control over the greenhouse gas reservoir;[13]

    (b) That the greenhouse gas reservoir is not in the same location as where the mitigation activity is implemented; and

[12] Moral hazard issues do not arise because proponents of mechanism methodologies may propose alternative approaches only where activity participants have no direction or influence over the relevant greenhouse gas reservoirs, which is required to satisfy paragraph 13(a). In contrast, moral hazard issues would be present if activity participants have direction or influence over the relevant greenhouse gas reservoirs. In that case, however, proponents of mechanism methodologies would not be allowed to propose alternative approaches because they would fail the requirements of paragraph 13(a).

[13] In this context, control means that the activity participants have direction and influence on the greenhouse gas reservoir through financial, policy, management or other instruments.

(c) That changes observed in the greenhouse gas reservoir cannot be attributed to the mitigation activity.[14]

14. When a proponent of a mechanism methodology proposes alternative approaches for any of the provisions listed in paragraph 15 below, they shall provide appropriate justification for why the conditions set out in paragraph 13 above apply to each relevant greenhouse gas reservoir.

15. Proponents of mechanism methodologies may propose alternative approaches to any of the following provisions, so long as those alternative approaches meet the conditions of paragraphs 13 and 14 above:

(a) General requirements for the identification and quantification of reversals (section 7.1 of this document);

(b) Frequency of submitting monitoring reports (section 7.2 of this document);

(c) Monitoring and reporting in the post-crediting period (section 7.4 of this document);

(d) Reversal-related notifications and reports (section 2 of "Information note: Elements related to non-permanence and reversals for inclusion in relevant regulatory documents" (A6.4-SBM018-A14));

(e) Post-crediting period monitoring and reporting (section 4 of "Information note: Elements related to non-permanence and reversals for inclusion in relevant regulatory documents" (A6.4-SBM018-A14)); and

(f) Post-reversal actions (section 5 of "Information note: Elements related to non-permanence and reversals for inclusion in relevant regulatory documents" (A6.4-SBM018-A14)).

16. None of the alternative approaches proposed per paragraph 15 above shall limit or exempt Article 6.4 activities from following any other requirements, including, without limitation:

(a) The “Methodological tool: Reversal risk assessment”;[15]

(b) The “Tool: Article 6.4 sustainable development tool” (A6.4-TOOL-AC-001);[16] and

(c) Any monitoring and reporting obligations unrelated to the management of non-permanence and reversals.

17. A summary of the provisions that are eligible for alternative approaches and their relationship to the Removals Standard and the “Concept note: Applicability of removal guidance to emission reductions and vice versa” (A6.4-MEP007-A03)[17] is shown in Table below.

[14] This could apply, for example, to a cookstove efficiency project that reduces demand for non-renewable biomass, and that biomass is collected by individuals from forests on publicly held lands located a few kilometres from their residences. Neither the cookstove project owner nor the participating households have control over the forests from which biomass is sourced. The public entity could implement forest management practices that enhance biomass stocks, unrelated to the impacts of the project; similarly, the public entity could implement harvesting that would reduce biomass stocks, once again affecting the reservoir but unrelated to the impacts of the project.

[15] This document is under development.

[16] https://unfccc.int/sites/default/files/resource/A6.4-TOOL-AC-001.pdf.

[17] https://unfccc.int/sites/default/files/resource/A6.4-MEP007-A03.pdf.

Table. Summary of alternative approaches that may be considered

Issue	Concept note[17]	Removals Standard	Provisions eligible for alternative approaches
Monitoring	Section 3.2.3	Section 4.1	Section 7.1 of this document Section 7.2 of this document Section 7.4 of this document Section 2 of "A6.4-SBM018-A14''
Reporting	Section 3.2.4	Section 4.2	Section 7.1 of this document Section 7.2 of this document Section 7.4 of this document Section 2 of "A6.4-SBM018-A14"
Post-crediting period monitoring and reporting	Section 3.2.5	Section 4.3	Section 7.4 of this document Section 3 of "A6.4-SBM018-A14". Section 4 of " A6.4-SBM018-A14"
Addressing reversals	Section 3.2.8	Section 4.6.2; and Section 4.6.3	Section 5 of " A6.4-SBM018-A14"

6. Quantification of emission reductions and/or net removals and reversals

18. Mechanism methodologies shall quantify emission reductions and/or net removals, and any reversals, consistent with the equations set out in this section as follows:

    (a) Mechanism methodologies shall apply all subsections of this section for use during an Article 6.4 activity's crediting period; and

    (b) Mechanism methodologies shall apply section 6.1 for use during an Article 6.4 activity's post-crediting monitoring period.

6.1. Net change in storage of a greenhouse gas or a precursor of a greenhouse gas

19. Mechanism methodologies shall include equations that determine, for use during the Article 6.4 activity's crediting period, the net change in storage resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t*, consistent with the following equation:[18]

$$\Delta S_t = \sum_i \left[\left(S_{i,activity,end,t} - S_{i,activity,start,t} \right) - \left(S_{i,baseline,end,t} - S_{i,baseline,start,t} \right) \right] \quad \text{Equation (1)}$$

Where:

ΔS_t = The net change in storage of a greenhouse gas, or a precursor of a greenhouse gas, resulting from the Article 6.4 activity across all applicable reservoirs *i* over the period of time covered by a monitoring report *t*, expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)

[18] Note that ΔS_t may be determined by monitoring different parameters than those in this equation as long as this delivers an equivalent outcome. For example, in the case of carbon capture and storage in geological reservoirs, the flux of carbon injected in the reservoir may be a key parameter to estimate the stock, rather than directly measuring the stock within the reservoir. Similarly, in the land-use sector, the increment in stocks rather than the total stocks may be measured. For some activities, where direct measurements are infeasible, it may be appropriate to use mass balances and/or modelling approaches.

$S_{i,activity,end,t}$ = The quantity of a greenhouse gas, or a precursor of a greenhouse gas, stored in the greenhouse gas reservoir *i* in the Article 6.4 activity scenario at the end of the period of time covered by a monitoring report *t*, expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)

$S_{i,activity,start,t}$ = The quantity of a greenhouse gas, or a precursor of a greenhouse gas, stored in the greenhouse gas reservoir *i* in the Article 6.4 activity scenario at the start of the period of time covered by a monitoring report *t*, expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)

$S_{i,baseline,end,t}$ = The quantity of a greenhouse gas, or a precursor of a greenhouse gas, stored in the greenhouse gas reservoir *i* in the baseline scenario at the end of the period of time covered by a monitoring report *t*, expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)

$S_{i,baseline,start,t}$ = The quantity of a greenhouse gas, or a precursor of a greenhouse gas, stored in the greenhouse gas reservoir *i* in the baseline scenario at the start of the period of time covered by a monitoring report *t*, expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)

i = The greenhouse gas reservoir(s) identified in paragraph 11 above and included in the activity boundary of an Article 6.4 activity

t = The number of the Article 6.4 activity monitoring report during the Article 6.4 activity's crediting period, with *t* = 1 for the report of the first monitoring period

20. A reversal occurs during an Article 6.4 activity's active crediting period when the net change in storage is less than zero ($\Delta S_t < 0$) in the monitoring report for any monitoring period after the first one (i.e., for $t \geq 2$), with the quantity of the reversal specified by ΔS_t.[19]

21. For monitoring reports used to quantify reversals during an Article 6.4 activity's post-crediting monitoring period, mechanism methodologies shall include equations that determine the net change in storage resulting from the Article 6.4 activity over the period of time covered by a monitoring report *k* in the post-crediting monitoring period, consistent with the following equation:

$$\Delta S_{PC,k} = \sum_i \left[\left(S_{i,activity,end,k} - S_{i,activity,crediting} \right) \right] \quad \text{Equation (2)}$$

Where:

$\Delta S_{PC,k}$ = The net change in storage of a greenhouse gas, or a precursor of a greenhouse gas, resulting from the Article 6.4 activity across all applicable reservoirs *i* over the period of time covered by a monitoring report *k* in the post-crediting monitoring period, expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)

$S_{i,activity,end,k}$ = The quantity of a greenhouse gas, or a precursor of a greenhouse gas, stored in the greenhouse gas reservoir *i* in the Article 6.4 activity scenario at the end of the period of time covered by a monitoring report *k* in the post-crediting monitoring period, expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)

$S_{i,activity,crediting}$ = The quantity of a greenhouse gas, or a precursor of a greenhouse gas, stored in the greenhouse gas reservoir *i* in the Article 6.4 activity scenario at the end of the Article 6.4 activity's last active crediting period, expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)

[19] Note that although the net change in greenhouse gas storage could be negative for t = 1 ($\Delta S1 < 0$), this would not constitute a reversal because no A6.4ERs would have been issued to the Article 6.4 activity.

i = The greenhouse gas reservoir(s) identified in paragraph 11 above and included in the activity boundary of an Article 6.4 activity

k = The number of the Article 6.4 activity monitoring report during the post-crediting monitoring period, with *k = 1* for the first monitoring report in the post-crediting monitoring period

22. For monitoring reports used to establish that no reversal has occurred in the post-crediting monitoring period, mechanism methodologies may include provisions to establish that no reversal has occurred ($\Delta S_{PC,k} \geq 0$) without quantifying the amount of greenhouse gases or their precursors stored in each applicable greenhouse gas reservoir ($S_{i,activity,end,k}$).

23. For the purpose of paragraphs 21 and 22, a reversal occurs during an Article 6.4 activity's post-crediting monitoring period when $\Delta S_{PC,k} < 0$.

24. The approach set out in paragraphs 21 and 22 above will in most instances result in a conservative quantification of reversals. In few instances, the approach may need to be amended or revised to ensure conservativeness.[20] In such instances, the mechanism methodology shall include provisions for amending or revising the approach accordingly.

6.2. Net change in emissions of greenhouse gases

25. Mechanism methodologies shall include equations that determine the net change in emissions resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t*. This shall not include any emissions from losses of storage from the greenhouse gas reservoir(s) included in Equation 1 above.[21] The net change in emissions shall be determined consistent with the following equation:

$$\Delta E_t = \sum_s AE_{s,t} + \max\left(0, \sum_j LE_{j,t}\right) - \sum_s BE_{s,t} \qquad \text{Equation (3)}$$

Where:

ΔE_t = The net change in greenhouse gas emissions, from sources other than any losses in storage from the greenhouse gas reservoir(s) included in Equation 1, resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t* and expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)

$AE_{s,t}$ = Greenhouse gas emissions from source *s* included in the activity boundary, occurring in the Article 6.4 activity scenario over the period of time covered by a monitoring report *t* and expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)

[20] For example, a single geological reservoir could be used by different activities, including activities registered under other carbon crediting programmes or covered by emissions trading schemes. In these instances, the methodology may need to include additional provisions to allocate any losses to the different activities. Another example could be an afforestation activity where reversal could occur if no further carbon is accumulated in the Article 6.4 scenario whereas further carbon would be accumulated over time in the baseline, i.e. in the absence of the Article 6.4 activity.

[21] For example, in the case of an afforestation activity, such emissions may include emissions from road transportation or fertilizer application but do not include any carbon dioxide emissions from loss of above-ground biomass, as the latter is included in the term ΔS_t in Equation 1. In the case of a direct air carbon capture and storage activity, such emissions could include emissions from consumption of electricity required for the operation of the capture plant.

$LE_{j,t}$ = Greenhouse gas emissions from leakage source *j* resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t*, expressed in metric tonnes of carbon dioxide equivalent (tCO_2e).[22]

$BE_{s,t}$ = Greenhouse gas emissions from source *s* in the baseline scenario over the period of time covered by a monitoring report *t*, expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)

s = Emission sources included in the activity boundary in the Article 6.4 activity scenario and baseline scenario, other than emissions from losses in carbon storage from the greenhouse gas reservoir(s) included in Equation 1

j = Leakage sources considered in the mechanism methodology in the Article 6.4 activity scenario and, where applicable, the baseline scenario

t = The number of the Article 6.4 activity monitoring report during the Article 6.4 activity's crediting period, with *t = 1* for the first monitoring report

6.3. Total A6.4ER issuance

26. Mechanism methodologies shall include equations that determine the total number of A6.4ERs to be issued for an Article 6.4 activity over the period of time covered by a monitoring report *t*, consistent with the following equation:

$$A6.4ER_{total,t} = \Delta S_t - \Delta E_t - CD_{t-i} \quad \text{Equation (4)}$$

Where:

$A6.4ER_{total,t}$ = The total number of A6.4ERs to be issued with respect to emission reductions and/or net removals resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t*

ΔS_t = The net change in storage of a greenhouse gas, or a precursor of a greenhouse gas, resulting from the Article 6.4 activity across all applicable reservoirs over the period of time covered by a monitoring report *t*, expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)

ΔE_t = The net change in greenhouse gas emissions, from sources other than any losses in storage from the greenhouse gas reservoir(s) included in Equation 1, resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t* and expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)

CD_{t-i} = A net increase in greenhouse gas emissions resulting from an Article 6.4 activity caused by factors other than reversals (a "crediting deficit"), applicable to the monitoring report *t-1* and expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)

t = The number of the Article 6.4 activity monitoring report during the Article 6.4 activity's crediting period, with *t = 1* for the first monitoring report

[22] Note that the maximum of zero and the sum of all leakage emissions is used in Equation 3 because, in accordance with paragraph 10 of the "Standard: Addressing leakage in mechanism methodologies", leakage shall be set to zero if the sum of all sources of leakage results in a net decrease in greenhouse gas emissions or increase in greenhouse gas removals.

6.4. Crediting deficit

27. Mechanism methodologies shall include equations that determine any crediting deficit resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t* (CD_t), consistent with the following equations:

$$A6.4ER_{total,t} \geq 0, \text{then } CD_t = 0 \qquad \text{Equation (5)}$$

$$\text{If } A6.4ER_{total,t} < 0 \text{ and } \Delta S_t \geq 0, \text{ then } CD_t = -1 \times A6.4ER_{total,t} \qquad \text{Equation (6)}$$

$$\text{If } A6.4ER_{total,t} < 0 \text{ and } \Delta S_t < 0, \text{then } CD_t = \max(0, CD_{t-1} + \Delta E_t) \qquad \text{Equation (7)}$$

Where:

$A6.4ER_{total,t}$	=	The total number of A6.4ERs to be issued with respect to emission reductions and/or net removals resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t*
ΔS_t	=	The net change in storage of a greenhouse gas, or a precursor of a greenhouse gas, resulting from the Article 6.4 activity across all applicable reservoirs over the period of time covered by a monitoring report *t*, expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)
ΔE_t	=	The net change in greenhouse gas emissions, from sources other than any losses in storage from the greenhouse gas reservoir(s) included in Equation 1, resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t* and expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)
CD_t	=	A net increase in greenhouse gas emissions resulting from an Article 6.4 activity caused by factors other than reversals (a "crediting deficit"), applicable to the monitoring report *t* and expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)
CD_{t-1}	=	A net increase in greenhouse gas emissions resulting from an Article 6.4 activity caused by factors other than reversals (a "crediting deficit"), applicable to the monitoring report *t-1* and expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)
t	=	The number of the Article 6.4 activity monitoring report during the Article 6.4 activity's crediting period, with *t = 1* for the first monitoring report

28. When the crediting deficit is greater than zero, it reflects a net increase in greenhouse gas emissions resulting from an Article 6.4 activity due to factors other than reversals. A crediting deficit can occur when the net change in storage (ΔS_t) over the period of time covered by a monitoring report *t* is positive, but smaller than a net increase in emissions over the same time period (i.e., $\Delta E_t \geq \Delta S_t$).[23] A crediting deficit can persist from one period of time to the next, so long as A6.4ER issuance is too small to compensate for the crediting deficit. If a crediting deficit persists at the end of the last active crediting period, any such deficit will remain unaddressed.

[23] For example, this could occur where an afforestation activity maintains previously achieved carbon stocks but does not further enhance carbon stocks, while still causing emissions from road transportation. This could also occur if a bioenergy project with carbon capture and storage or a direct air capture project stores carbon dioxide in a subsurface geologic reservoir while emitting a greater quantity of carbon dioxide to the atmosphere from its operations.

29. Crediting deficits affect future A6.4ER issuance requests and are adjusted, as applicable, at each A6.4ER issuance request. When there is a crediting deficit from the period of time covered by a monitoring report *t-1*, any non-zero A6.4ER issuance for the period of time covered by the monitoring report *t* will be reduced and the crediting deficit updated accordingly. This can happen in three ways:

    (a) If total A6.4ER issuance is greater than or equal to zero ($A6.4ER_{total,t} \geq 0$), then Equation *5* applies. This indicates that the quantity of emission reductions and/or net removals in the period of time covered by the monitoring report *t* was sufficient to eliminate the crediting deficit, if any, from the period of time covered by the monitoring report *t-1*. If the crediting deficit from the period of time covered by the monitoring report *t-1* is positive, then the A6.ER issuance for the period of time covered by the monitoring report *t* is reduced by the same quantity; and if the crediting deficit from the period of time covered by the monitoring report *t-1* is zero, then the A6.ER issuance for the period of time covered by the monitoring report *t* is unchanged. In either case, the crediting deficit for the period of time covered by the monitoring report *t* is zero;

    (b) If total A6.4ER issuance is less than zero ($A6.4ER_{total,t} < 0$) and the net change in storage is greater than or equal to zero ($\Delta S_t \geq 0$), then Equation *6* applies. In this case, there is a crediting deficit for the period of time covered by the monitoring report *t* equal to the total A6.4ER issuance ($A6.4ER_{total,t}$) multiplied by negative 1. This situation occurs when there is no reversal and therefore an overall increase in total greenhouse gas storage ($\Delta S_t \geq 0$), but the combination of any net change in greenhouse gas emissions and any previous crediting deficit is greater than the net change in greenhouse gas storage (i.e., $\Delta E_t + CD_{t-1} \geq \Delta S_t$);

    (c) If both the total A6.4ER issuance and the net change in storage are less than zero ($A6.4ER_{total,t} < 0$ and $\Delta S_t < 0$), then Equation *7* applies. This situation results in a different formula for the calculation of the crediting deficit because the net loss in greenhouse gas storage ($\Delta S_t < 0$) is addressed by operations of the reversal risk buffer pool account, rather than through reductions in subsequent A6.4ER issuance.

30. The initial crediting deficit at the start of the first monitoring period $t = 1$ of an Article 6.4 activity (CD_0) is set to zero by definition.

6.5. A6.4ER contributions to the reversal risk buffer pool account

31. Mechanism methodologies shall include an equation that determines the number of A6.4ERs to be forwarded[24] to the reversal risk buffer pool account, as follows:

$$A6.4ER_{buffer,t} = \sum_i \left[max\left(0, \Delta S_{i,t}\right) \times F_{buffer,i,t} \right] \quad \text{Equation (8)}$$

Where:

$A6.4ER_{buffer,t}$ = The number of A6.4ERs that are issued with respect to emission reductions and/or net removals resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t* and to be forwarded to the reversal risk buffer pool account

[24] A6.4ERs contributions to the reversal risk buffer pool are to be considered as 'forwarded' without effecting a first transfer pending a future decision by the Supervisory Body.

$\Delta S_{i,t}$	=	The net change in storage of a greenhouse gas, or a precursor of a greenhouse gas in greenhouse gas reservoir *i*, resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t* and expressed in metric tonnes of carbon dioxide equivalent (tCO_2e)
$F_{buffer,i,t}$	=	The fraction of the net enhancement in storage of a greenhouse gas or a precursor in reservoir *i*, resulting from the Article 6.4 activity over the period of time covered by monitoring report *t*, as determined by the reversal risk assessment tool, and used for the purpose of determining the number of A6.4ERs to be forwarded to the reversal risk buffer pool account
i	=	The greenhouse gas reservoir(s) identified in paragraph 11 above and included in the activity boundary of an Article 6.4 activity
t	=	The number of the Article 6.4 activity monitoring report during the Article 6.4 activity's crediting period, with *t = 1* for the first monitoring report

32. Mechanism methodologies may propose alternative approaches to determine $A6.4ER_{buffer,t}$ if:

(a) The outcome is aligned with the approach in Equation 8; or

(b) The proponent of the mechanism methodology justifies, with appropriate evidence, that a different approach that applies to Article 6.4 activities involving more than one greenhouse gas reservoir will result in a conservative treatment of reversal risks.

6.6. A6.4ER contributions to the Adaptation Fund

33. Mechanism methodologies shall include an equation that determines the total number of mitigation contribution A6.4ERs to be forwarded or authorised A6.4ERs to be first transferred, as applicable, to an account held by the Adaptation Fund in the mechanism registry for assisting developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation, as follows:

$$A6.4ER_{SOP,t} = A6.4ER_{total,t} \times SOP \quad \text{Equation (9)}$$

Where:

$A6.4ER_{SOP,t}$	=	The total number of A6.4ERs to be issued with respect to emission reductions and/or net removals resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t* and to be forwarded or first transferred, as applicable, to an account of the Adaptation Fund in the mechanism registry
$A6.4ER_{total,t}$	=	The total number of A6.4ERs to be issued with respect to emission reductions and/or net removals resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t*
SOP	=	The share of proceeds designated to support the Adaptation Fund
t	=	The number of the Article 6.4 activity monitoring report during the Article 6.4 activity's crediting period, with *t = 1* for the first monitoring report

34. The term *SOP* shall be set to:

(a) Zero percent for Article 6.4 activities located in least developed countries (LDCs) and small islands developing states (SIDS) for which host countries have chosen to apply the exemption granted by 6/CMA.6 paragraph 20; or

(b) 5 percent for Article 6.4 activities located in all other host countries, pursuant to paragraph 58 of Annex I of decision 3/CMA.3.

6.7. A6.4ER contributions to overall mitigation in global emissions

35. Mechanism methodologies shall include an equation that determines the number of mitigation contribution A6.4ERs to be forwarded or authorised A6.4ERs to be first transferred, as applicable, to the account for cancellation towards delivering overall mitigation in global emissions, as follows:

$$A6.4ER_{OMGE,t} = A6.4ER_{total,t} \times OMGE \quad \text{Equation (10)}$$

Where:

$A6.4ER_{OMGE,t}$	=	The number of A6.4ERs to be issued with respect to emission reductions and/or net removals resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t* and to be forwarded or first transferred, as applicable, to the account for cancellation towards delivering overall mitigation in global emissions
$A6.4ER_{total,t}$	=	The total number of A6.4ERs to be issued with respect to emission reductions and/or net removals resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t*
$OMGE$	=	The contribution to deliver overall mitigation in global emissions
t	=	The number of the Article 6.4 activity monitoring report during the Article 6.4 activity's crediting period, with *t = 1* for the first monitoring report

36. The term *OMGE* shall be set at a minimum of 2 percent, pursuant to paragraph 95 of Appendix 1 of decision 3/CMA.3.

6.8. A6.4ER issuance to activity participants

37. Mechanism methodologies shall include an equation that determines the number of A6.4ERs to be forwarded or first transferred, as applicable, to the accounts of activity participants as follows:

$$A6.4ER_{activity,t} = A6.4ER_{total,t} - A6.4ER_{SOP,t} - A6.4ER_{OMGE,t} - A6.4ER_{buffer,t} \quad \text{Equation (11)}$$

Where:

$A6.4ER_{activity,t}$	=	The number of Article 6.4ERs to be issued with respect to emission reductions and/or net removals resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t* and to be forwarded or first transferred, as applicable, to accounts of the activity participants
$A6.4ER_{total,t}$	=	The total number of A6.4ERs to be issued with respect to emission reductions and/or net removals resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t*
$A6.4ER_{SOP,t}$	=	The total number of A6.4ERs to be issued with respect to emission reductions and/or net removals resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t* and to be forwarded or first transferred, as applicable, to an account of the Adaptation Fund in the mechanism registry

$A6.4ER_{OMGE,t}$	=	The number of A6.4ERs to be issued with respect to emission reductions and/or net removals resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t* and to be forwarded or first transferred, as applicable, to the account for cancellation towards delivering overall mitigation in global emissions
$A6.4ER_{buffer,t}$	=	The number of A6.4ERs that are issued with respect to emission reductions and/or net removals resulting from the Article 6.4 activity over the period of time covered by a monitoring report *t* and to be forwarded to the reversal risk buffer pool account
t	=	The number of the Article 6.4 activity monitoring report during the Article 6.4 activity's crediting period, with t = 1 for the first monitoring report

7. Identification and quantification of reversals

7.1. General requirements

38. Mechanism methodologies shall specify the data and methods required to:

    (a) Detect changes in the quantity of greenhouse gases or their precursors stored in all applicable greenhouse gas reservoirs, consistent with section 6.1;

    (b) Quantify changes in the quantity of greenhouse gases or their precursors stored in all applicable greenhouse gas reservoirs in the Article 6.4 activity scenario and the baseline scenario, consistent with section 6.1;

    (c) Determine whether a reversal has occurred, consistent with section 6.1; and

    (d) Classify any reversal as being avoidable, unavoidable, or partially avoidable and partially unavoidable, consistent with section 7.3.

39. For the purpose of identifying whether any observed event involving the release of stored greenhouse gases has led to a reversal, mechanism methodologies may include provisions to conservatively calculate the total removals expected to occur within the monitoring period in which the observed event took place. If the total expected removals within the monitoring period are larger than the sum of emissions from all observed events involving the release of stored greenhouse gases within the same monitoring period, then methodologies may determine that no reversal is deemed to have occurred for the purpose of notifying the Supervisory Body of observed events involving the release of stored greenhouse gases. The provisions of this paragraph shall only apply to activity types that generate ongoing net removals without ongoing interventions by the activity participant,[25] and shall not be applied to any other matters, such as quantification of emission reductions and/or net removals.

40. For the purpose of preparing preliminary assessment reports, mechanism methodologies shall require activity participants to submit a monitoring report in cases where it is ambiguous as to whether an observed event of greenhouse gas release constitutes a reversal.

41. For the purpose of preparing monitoring reports only for the post-crediting monitoring period and only in cases where no reversal is reported, mechanism methodologies may establish provisions for activity participants to demonstrate that no reversal has occurred (i.e., to show that $\Delta S_{PC,k} \geq 0$) rather than quantify the amount of the net change in storage ($\Delta S_{PC,k}$).

[25] This includes, for example, many forestry activities.

7.2. Frequency of submitting monitoring reports

42. Mechanism methodologies shall specify the minimum frequency at which monitoring reports must be submitted during the crediting periods and post-crediting monitoring period. The minimum frequency shall be between one and five years and be based on the nature, the type, and the risk of reversals. A less frequent requirement from within this range (i.e., a larger gap between monitoring reports) is appropriate where the quantification of emission reductions or net removals is associated with considerable costs[26] and/or where emission reductions or net removals can only be observed over longer time periods.[27] The minimum frequency may also change over time, while being within the above specified range.

7.3. Determination of whether reversals are avoidable or unavoidable

43. Mechanism methodologies shall include provisions to classify reversals as avoidable or unavoidable, taking into the account the type of activities eligible under the methodology. Where necessary, mechanism methodologies shall also include a procedure to apportion the total amount of reversals into a portion of avoidable reversals and a portion of unavoidable reversals.

44. Mechanism methodologies shall classify the following types of reversals, inter alia, as avoidable:

    (a) Reversals resulting from the management of the Article 6.4 activity and any other wilful actions by the activity participants;[28]

    (b) Reversals resulting from mismanagement, neglect or illegal actions by the activity participants, including as a consequence of bankruptcy, insolvency, or default;

    (c) Reversals resulting from the intentional use of a product or material, in which a greenhouse gas or a precursor of a greenhouse gas was stored under an Article 6.4 activity, such that a greenhouse gas is released to the atmosphere;[29]

    (d) Reversals that have occurred following a failure to implement the risk mitigation plan that is attributable to the activity participants; and

    (e) Reversals deemed to have occurred when an annual reversal report or a monitoring report is missing, as defined in section 2.3 of the "Information note: Elements related to non-permanence and reversals for inclusion in relevant regulatory documents" (A6.4-SBM018-A14).

45. Mechanism methodologies shall classify the following types of reversals, inter alia, as unavoidable:

    (a) Reversals resulting from natural disturbances and extreme events;[30]

[26] For example, costs for sampling the carbon content at plots in the land-use sector.

[27] For example, changes in soil organic carbon following changes in land-use practices may only be observable over longer time periods.

[28] For example, harvesting of trees, slash burns, land conversion, changes in land management practices that were not described in the project design document, induced seismicity or fractures in geological reservoirs due to injection practices.

[29] For example, combustion of biomass previously stored in buildings.

[30] For example, wildfires, accidental fires in the built environment, pests and disease infestation, droughts, hurricanes, floods, landslides, earthquakes, and volcanic eruptions.

(b) Reversals resulting from declared war, undeclared war, or acts of terrorism;

(c) Reversals resulting from changes in policies or legal requirements that prevent the activity participants from implementing risk mitigation plans; and

(d) Reversals resulting from illegal action by third parties that cannot be controlled, influenced or managed using legal means by the activity participants.

46. Reversals caused by any factors that were not identified in an Article 6.4 activity's reversal risk assessment(s), as updated, shall be classified as avoidable reversals by default and may only be classified as unavoidable with due justification (e.g., in cases of clear "force majeure").

7.4. Monitoring and reporting in the post-crediting monitoring period

47. Mechanism methodologies may identify conditions under which activity participants may or shall update their monitoring plan for the post-crediting monitoring period, e.g., updates to monitoring techniques or approaches.

48. Mechanism methodologies shall define a minimum period for monitoring during the post-crediting monitoring period, after which activity participants may submit a request for termination of monitoring during the post-crediting monitoring period through demonstration of a negligible risk of reversal. The minimum period shall be informed by, inter alia, a consideration of the mitigation activity type and its associated reversal risks.

49. Mechanism methodologies shall define a set of conditions or criteria that must be satisfied in order for activity participants to demonstrate negligible risk of reversal,[31] considering the mitigation activity type and its associated reversal risks. The conditions or criteria shall ensure that the greenhouse gases or their precursors that are stored by the Article 6.4 activity within the applicable greenhouse gas reservoir(s) have reached and will remain in a steady state or, where relevant, are stabilized for at least 100 years from the year of demonstration of negligible risk of reversal.

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[31] For example, in the case of sub-surface CO_2 storage, such conditions and criteria may pertain to the behaviour of the stored CO_2 in the geological reservoir. For biochar, conditions and criteria may pertain, inter alia, to restrictions on applications that could result in the release of the carbon stored in biochar (such as through combustion) and criteria on the characteristics of the biochar.