

A6.4-MEP016-A07

Draft Methodological tool

Reversal Risk Assessment

Version 02.0

DRAFT



United Nations
Framework Convention on
Climate Change

COVER NOTE

1. Procedural background

1. The Supervisory Body of the Article 6.4 mechanism established by Article 6, paragraph 4, of the Paris Agreement (the Supervisory Body), at its tenth meeting (SBM 010), requested the Methodological Expert Panel (MEP) to prepare recommendations on products related to addressing reversals. In particular, the Supervisory Body requested the MEP to prepare recommendations on the following matters:¹
 - (a) Guidance on post-crediting period monitoring, reporting and remediation of reversals, post-reversal action, and host Party roles;
 - (b) Guidance on late, incomplete, or missing monitoring report submissions and treatment of activities for which a reversal results in removals level that falls below baseline;
 - (c) Reversal risk assessment tool; and
 - (d) Guidance on avoidable and unavoidable reversals and reversal compensation.
2. The MEP, at its first meeting (MEP 001), initiated its work on the above issues and agreed to recommend that, due to the overlap and interdependencies between the four separate elements listed in paragraph 1 as well as additional removal-related issues in the “Recommendation: Activities involving removals under the Article 6.4 mechanism” (A6.4-SB009-A02)² on which the Supervisory Body also requested input, the four elements mentioned above should be incorporated into a single integrated standard on addressing non-permanence and reversals.
3. The Supervisory Body, at its eleventh meeting (SBM 011), agreed on the recommendation of the MEP to consolidate the four related issues and to develop a standard on addressing non-permanence and reversals covering these issues in the “Information Note: Workplan of the Methodological Expert Panel 2024” (A6.4-SB011-A02).³
4. The SBM 014, approved the “Standard: Requirements for activities involving removals under the Article 6.4 mechanism” (A6.4-STAN-METH-002) (hereinafter referred to as the “Removals Standard”).⁴ Section 4.6.1 of the Removals Standard (Version 01.0) provides direction on reversal risk assessment, and paragraph 37 notes, inter alia, the following reversal risks:
 - (a) Activity finance and management, asset ownership, rising opportunity costs;
 - (b) Regulatory uncertainty and social instability, political, governance and legal risks, acts of terrorism, crime, and war;

¹ See https://unfccc.int/sites/default/files/resource/SB010_report.pdf.

² See <https://unfccc.int/sites/default/files/resource/a64-sb009-a02.pdf>.

³ See <https://unfccc.int/sites/default/files/resource/a64-sb011-a02.pdf>.

⁴ See <https://unfccc.int/sites/default/files/resource/A6.4-STAN-METH-002.pdf>.

- (c) Natural disturbances and extreme events such as fires, pests, droughts, hurricanes, floods, landslides, earthquakes, volcanic eruptions, geological faults, and fractures; and
 - (d) Climate change impacts exacerbating any of the above risks.
- 5. The SBM 015, approved the “Information Note: Workplan of the Methodological Expert Panel 2025” (A6.4-SBM015-A02),⁵ which reaffirmed the MEP’s mandate to propose a draft methodological standard addressing non-permanence and reversals as well as a draft methodological tool on reversal risk assessment that would address the following considerations:
 - (a) Whether upper limits are needed in respect of the risk rating (overall) or specific risk factors (within the tool), including options and science-based rationales for upper limit(s);
 - (b) Risk rating that constitutes a negligible risk;
 - (c) Any further categorization of risk; and
 - (d) How remediation measures are taken into account in the risk assessment tool.⁶
- 6. The MEP 005, began work on the draft “Methodological tool: Reversal risk assessment” (hereinafter referred to as the “reversal risk assessment tool”) consistent with the Supervisory Body’s updated mandate to develop a separate methodological tool, while also continuing its work on the Supervisory Body’s earlier mandate to develop a methodological standard addressing non-permanence and reversals.
- 7. The MEP 008, recommended a draft “Standard: Addressing non-permanence and reversals” (A6.4-MEP008-A03).⁷ This document included proposed direction to mechanism methodologies and proposed direction to activity participants in separate appendices.
- 8. The SBM 018, reviewed the MEP’s recommended draft standard and approved two documents:
 - (a) “Standard: Addressing non-permanence and reversals in mechanism methodologies” (A6.4-STAN-METH-007) (hereinafter referred to as the “Reversals Standard”), incorporating all provisions directed at mechanism methodologies;⁸ and
 - (b) “Information Note: Elements related to non-permanence and reversals for inclusion in relevant regulatory documents” (A6.4-INFO-METH-002) (hereinafter referred to

⁵ See <https://unfccc.int/sites/default/files/resource/A6.4-SBM015-A02.pdf>.

⁶ The MEP notes that although the Supervisory Body used the term “remediation” in this mandate, it might be more consistent to use the term reversal risk “mitigation” because “remediation” has a separate and distinct meaning in the context of addressing verified reversals in the Removals Standard and Reversals Standard. Accordingly, the MEP refers to reversal risk “mitigation” here to avoid potential confusion, without any intent to change the substantive meaning of the original mandate.

⁷ See <https://unfccc.int/sites/default/files/resource/A6.4-MEP008-A03.pdf>.

⁸ See <https://unfccc.int/sites/default/files/resource/A6.4-STAN-METH-007.pdf>.

as the “Information Note”), incorporating all provisions directed at activity participants.⁹

9. The Conference of the Parties serving as the meeting of the Parties to the Paris Agreement, at its seventh session, requested the Supervisory Body to continue to ensure that methodological standards and tools “are based on the best available science and are informed by robust evidence” as well as to prioritize work on mechanism methodologies to support the transition of activities into the Article 6.4 mechanism (paragraphs 23-24 of decision 20/CMA.7).¹⁰
10. The MEP 014, agreed to structure the draft “Methodological tool: Reversal risk assessment” as a modular tool and to initiate a call for public input. The call was open from 03 to 24 July 2026, and a total of 35 submissions were received.¹¹ Section 3.10 below explains how the comments were addressed in the revised draft mechanism methodology. The first version of the tool would be applicable only to activities that reduce non-renewable biomass consumption, including clean cooking activities. The MEP also agreed that additional applications would be incorporated into future versions of the methodological tool.

2. Purpose

11. The purpose of this draft methodological tool is to allow activity participants to:
 - (a) Calculate the parameter $F_{buffer,i}$, defined as 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 this tool, which is used in mechanism methodologies to determine the number of Article 6, paragraph 4, emission reductions (A6.4ERs) to be forwarded to the reversal risk buffer pool account, consistent with equation (8) of version 1.0 of the Reversals Standard; and
 - (b) Determine whether the stored greenhouse gases (or precursors of greenhouse gases) for which A6.4ERs have been issued are at a negligible risk of reversal, as defined in their applicable mechanism methodology.
12. The first version of the tool is applicable only to Article 6.4 activities that reduce the consumption of non-renewable biomass (e.g., clean cooking activities).

3. Key issues and proposed solutions

3.1. Definitions

13. To facilitate a common understanding that can be applied across different greenhouse gas reservoirs and activity types, this draft methodological tool defines key terms (see paragraph 6 of the draft methodological tool). The definitions are intended to provide flexibility in assessing reversal risks across different levels of granularity, depending on the characteristics of greenhouse gas reservoirs, activity types, and the availability of relevant data.

⁹ See <https://unfccc.int/sites/default/files/resource/A6.4-INFO-METH-002.pdf>.

¹⁰ See <https://unfccc.int/documents/655275>.

¹¹ See <https://unfccc.int/process-and-meetings/the-paris-agreement/article-6/article-64-pacm/stakeholder-engagement/calls-for-input/MEP014>.

14. The proposed approach focuses on calculating reversal risk factors across different reversal risk types (e.g., losses due to individual reversal risks, such as wildfire, or broader categories of reversal risks, such as natural reversal risks).
15. Consistent with the Supervisory Body's mandate to address reversal risk mitigation (see paragraph 5(d) and footnote 6 of this cover note), the proposed approach also incorporates reversal risk mitigation factors that reduce the reversal risk factor for a given reversal risk type, based on reversal risk mitigation measures that reflect the expected effect of anthropogenic interventions.
16. The MEP notes that the provisions developed for this version of the draft methodological tool involve the use of default values for reversal risk factors for both natural and human-induced reversal risks, and reversal risk reduction factors for human-induced reversal risks only. Future extensions of the draft methodological tool to address other activity types may include or require other approaches (e.g., a site-specific reservoir assessment), depending on the characteristics of the applicable greenhouse gas reservoir.
17. The draft methodological tool also includes an approach to calculate the parameter $F_{buffer,i,t}$ (as discussed in section 3.6 below of this cover note), consistent with equation (8) of version 1.0 of the Reversals Standard and based on the reversal risk ratings for natural and human-induced reversal risks.

3.2. Scope of application

18. The MEP determined that the reversal risk assessment may require distinct considerations depending on the characteristics of different greenhouse gas reservoirs and activity types. Accordingly, the MEP agreed to structure the draft methodological tool as a modular document, with distinct applicability conditions and distinct substantive provisions across applications.
19. To support the transition of activities reducing non-renewable biomass consumption, e.g. activities involving energy efficient cooking, from the Clean Development Mechanism to the Article 6.4 mechanism, the MEP agreed that the first application of the draft methodological tool should apply only to Article 6.4 activities that reduce non-renewable biomass consumption, including activities involving energy efficient cooking.
20. General applicability conditions, which are intended to apply to all eligible activity types, are provided in section 4.1. Additional applicability conditions for activities reducing non-renewable biomass consumption are provided in section 4.2.
21. The MEP will further update the draft methodological tool to support additional activity types in future work. As announced in prior public plenary presentations, and without prejudice to any other potential applications, the MEP is already working on updates to this draft methodological tool to address the following applications:
 - (a) Forestry;
 - (b) Subsurface geologic storage; and
 - (c) Biochar.

3.3. Classification of reversal risk types for activities that reduce the consumption of non-renewable biomass

22. The MEP notes that Article 6.4 activities that reduce the consumption of non-renewable biomass are issued A6.4ERs for reductions in losses of non-renewable biomass (i.e., biomass gain relative to the baseline) in forests and has classified the reversal risks for this application into two categories:
- (a) Natural reversal risks (section 5.1.1 of the draft methodological tool);¹² and
 - (b) Human-induced reversal risks (section 5.1.2 of the draft methodological tool).¹³
23. Furthermore, given the significance of wildfire-related reversal risks and the ability to distinguish wildfire-related forest carbon losses from other natural drivers of forest carbon loss (e.g., drought and insect outbreaks), the MEP subdivided natural reversal risks into two types:
- (a) Wildfire; and
 - (b) All other natural reversal risks.
24. Accordingly, the reversal risk analysis for Article 6.4 activities that reduce non-renewable biomass consumption is conducted across the following reversal risk types:
- (a) Wildfire;
 - (b) All other natural reversal risks; and
 - (c) Human-induced reversal risks.
- 3.4. Alignment with the fNRB Tool**
25. The draft methodological tool provides default values that are aligned with the administrative boundaries used in the “Methodological tool: Fraction of non-renewable biomass” (A6.4-AMT-009) (hereinafter referred to as the “fNRB Tool”).¹⁴
26. For natural reversal risk factors, the draft methodological tool provides default values at each of the following geographic levels:
- (a) Multi-national;
 - (b) National; and
 - (c) Subnational.
27. To align with the requirements of the fNRB Tool and to simplify the application and verification of this draft methodological tool, activity participants are required to apply the same geographic level of analysis selected for the fNRB Tool, as directed by the applicable mechanism methodology (see paragraph 15(c) of the draft methodological tool).

¹² This category is intended to align with paragraph 37(c) of version 1.0 of the Removals Standard. As noted in section 3.5.2 of the cover note, the default values for natural reversal risks take into account the projected effects of climate change, consistent with paragraph 37(d) of version 1.0 of the Removals Standard.

¹³ This category is intended to align with paragraphs 37(a) and 37(b) of version 1.0 of the Removals Standard.

¹⁴ See <https://unfccc.int/process-and-meetings/the-paris-agreement/article-6/article-64-pacm/mechanism-process/methodologies/a64-amt-009>.

28. At the national level, default values are provided for natural reversal risk factors for all but six countries. Four of the countries have an fNRB value of 1 per cent or less (Djibouti, Iraq, Jordan, and Turkmenistan) while two have an fNRB value of 30 per cent (Eritrea) and 65 per cent (Mauritania). Article 6.4 projects or component projects (CPs) that select a national fNRB value and do not have corresponding national default values for reversal risk factors shall select sub-national or multi-national values in this draft methodological tool (see paragraph 19 of the draft methodological tool).

3.5. Determining default values for natural and human-induced reversal risks

3.5.1. Summary of key differences across reversal risk categories

29. This section provides an overview of the technical methods used to determine the default values for natural reversal risk factors (section 3.5.2 of this cover note) and the recommended approaches for selecting human-induced reversal risk factors, reversal risk mitigation actions, and reversal risk reduction factors (section 3.5.3 of this cover note). It also identifies key differences between:
- (a) Technical recommendations by the MEP based on explicit data or evidence (e.g., recommended matters related to natural reversal risks);
 - (b) Expert judgments by the MEP about technical matters that are based on, but not strictly determined by, data and evidence (e.g., recommended ranges for default values for human-induced reversal risk factors and human-induced reversal risk ratings, as well as recommended human-induced reversal risk mitigation actions); and
 - (c) Recommendations by the MEP on policy decisions that cannot be directly determined based on data or evidence, for which the Supervisory Body may be the more appropriate body to make a final determination of key parameters (e.g., the selection of specific default values for human-induced reversal risk factors and human-induced reversal risk ratings).
30. Notably, the proposed methodological approach differs substantially across the two reversal risk categories because, while it is possible to make technical recommendations based on explicit data and evidence for natural reversal risks, determining a range of default values for human-induced reversal risks require expert judgments and the selection of specific default values requires a policy decision:
- (a) **Natural reversal risk factors.** Default values for natural reversal risk factors were determined using a method that calculates historical rates of forest disturbance from satellite data, projects the expected future frequency of these events under climate change based on relationships established in the peer-reviewed academic literature, and assesses the severity of future carbon storage losses based on scenarios drawn from the peer-reviewed academic literature. This approach applied a peer-reviewed model and was produced by a technical consultant to the secretariat as part of the development of this methodological tool; and
 - (b) **Human-induced reversal risk factors.** In contrast, no empirically based data or methods to determine forward-looking human-induced reversal risk factors were identified during the development of this methodological tool. Instead, the MEP evaluated the available evidence and agreed to recommend a range of default values for human-induced reversal risk factors, using its expert judgment and drawing on available data and evidence. These decisions and their rationales are

documented further below. The MEP also agreed that the selection of a single default value requires a policy decision.

31. Another key difference reflects the fact that Article 6.4 activities that reduce non-renewable biomass generally do not have control over their applicable greenhouse gas reservoirs. The MEP agreed to apply a consistent approach to evaluating reversal risk remediation, pursuant to the mandate described in paragraph 5(d) of this cover note, in which the reversal risk ratings determined for natural and human-induced reversal risks are lowered by reversal risk reduction factors when an applicable reversal risk mitigation action is present. When reversal risk ratings are lowered by reversal risk reduction factors, fewer A6.4ERs are contributed to the Reversal Risk Buffer Pool Account and more A6.4ERs are issued to activity participants. However, the MEP determined that reversal risk mitigation actions were only relevant for human-induced reversal risks for the following reasons:
- (a) Natural reversal risks. The MEP was unable to identify any examples of reversal risk mitigation actions that have been implemented at the jurisdictional level to address natural reversal risks. As a result, the MEP agreed not to include reversal risk reduction factors for natural reversal risks (see paragraph 22 of the draft methodological tool). The MEP emphasized that this conclusion is limited to circumstances where the relevant greenhouse gas reservoir is:
 - (i) Not under the control of activity participants; and
 - (ii) Defined on a jurisdictional or other large-scale basis (e.g., at the sub-national, national, or multi-national level); and
 - (b) Human-induced reversal risks. In contrast, the MEP identified relevant reversal risk mitigation actions at the level of individual host Parties and recommended criteria to establish the presence of these reversal risk mitigation actions along with associated reversal risk reduction factors (see section 3.5.3.1.1 of this cover note). As indicated in the draft methodological tool, activity participants that demonstrate reversal risk mitigation actions shall apply associated reversal risk reduction factors to lower their human-induced reversal risk rating. As a result, they are assigned a lower overall reversal risk rating and are therefore required to contribute fewer A6.4ERs to the reversal risk buffer pool account than would be the case in the absence of reversal risk mitigation actions. Although the MEP agreed to recommend a range of default values for human-induced reversal risk reduction factors based on its expert judgment, the MEP also agreed that the selection of specific default values requires a policy judgment from the Supervisory Body.
32. In addition, the MEP noted that the expected timing of new evidence to inform updated technical recommendations is likely to vary across reversal risk categories as follows:
- (a) **Natural reversal risks.** Based on feedback from the technical consultant retained by the secretariat and stakeholder feedback, it appears that additional peer-reviewed studies could become available within 2-3 years. Accordingly, the MEP agreed to include a recommendation to the Supervisory Body to consider an update to these parameters consistent with this outlook (see paragraph 107 of this cover note). The MEP notes that the expected future availability of new information is based, in part, on the availability of a peer-reviewed analytical framework for projecting natural reversal risks, opportunities to refine and improve those efforts with additional evidence and analysis; and

- (b) **Human-induced reversal risks.** In contrast, the MEP does not have any specific expectation about the potential timing of any new evidence to inform updated technical recommendations for determining human-induced reversal risk factors or human-induced reversal risk reduction factors. With respect to reversal risk reduction factors, the MEP noted that it was unable to identify any evidence concerning the effectiveness of the reversal risk mitigation actions it identified (i.e., to inform a quantification of the effectiveness of implementing “Nationally Determined Contributions” (NDC), “Long-Term Low Greenhouse Gas Emission Development Strategies” (LT-LEDS), and “Reducing Emissions from Deforestation and Forest Degradation in Developing Countries” (REDD-plus) submissions in reducing human-induced reversal risks. New evidence concerning these matters may take many years to develop, potentially as much as a decade, as the recommended reversal risk mitigation actions are relatively new.

3.5.2. Natural reversal risks

33. To reflect the best available science and to ground the determination of natural reversal risk factors in robust evidence, consistent with paragraph 23 of decision 20/CMA.7, the MEP proposes to determine natural reversal risk factors using an analysis of global historical forest disturbance rates that is projected into the future, based on a peer-reviewed academic method that has been extended to apply to the Article 6.4 mechanism’s global context. The methods employed to determine natural reversal risk factors account for forest disturbances by addressing:
- (a) The exposure of forest carbon to reversal risks, as informed by existing above-ground and below-ground forest carbon stocks in a baseline year;
 - (b) The probability of a disturbance, as informed by the historical record of global satellite data documenting stand-clearing disturbances;
 - (c) The severity of a disturbance, as informed by an academic literature analysis that analyses the severity of forest carbon losses from disturbances in tropical forests separately from disturbances in temperate and boreal forests and calculates scenarios for different combinations of disturbance scenarios; and
 - (d) The use of a lower-emission climate scenario (SSP2-4.5) and a higher-emission climate scenario (SSP5-8.5) to model climate-change-related impacts on forest growth rates and disturbances due to natural reversal risks.^{15,16}
34. Natural reversal risk calculations were initially performed at the resolution of 8 km x 8 km grid cells with global forest coverage. Individual grid cells were then aggregated to the level of subnational, national, and multi-national boundaries following the same geographic definitions as used in the fNRB Tool (see section 3.4 of this cover note). Aggregation was performed as a weighted average based on existing forest carbon stocks for each grid cell within each applicable subnational, national, and multi-national boundary.

¹⁵ “SSP” refers to the Shared Socio-economic Pathway, describing the socio-economic trends underlying the scenario. SSP2-4.5 refers to the intermediate greenhouse gas emissions scenario, where compared to 1850 – 1900, global surface temperature averaged over 2081 – 2100 is very likely to be higher by 2.1 °C to 3.5 °C.

¹⁶ “SSP5-8.5” refers to the very high greenhouse gas emissions scenario, where compared to 1850-1900, global surface temperature averaged over 2081 – 2100 is very likely to be higher by 3.3 °C to 5.7 °C.

35. Full methodological details and supporting data are available in two publications. The analytical method used is the “absolute reversal” method from Wu et al. (2026) with global data and methods documented in Appendix 2 of the draft methodological tool and results calculated across nine disturbance scenarios and two climate scenarios.¹⁷
36. The MEP deliberated the choice of using disturbance scenarios and climate scenarios to select default values for natural reversal risk factors. The MEP proposes to choose:
- (a) The “tr55bt716” disturbance scenario, which represents a central estimate of calculated reversal risk factors as documented in Appendix 2 of the draft methodological tool; and
 - (b) The SSP2-4.5 climate scenario, noting that Appendix 2 of the draft methodological tool finds that reversal risks exhibit “similar magnitudes and spatial patterns under the two climate scenarios.”
37. The MEP considers that these proposed scenarios are appropriate in the context of Article 6.4 activities reducing non-renewable biomass consumption because these mechanism methodologies are not expected to require activity participants to monitor, report, or remediate any reversals that may occur, pursuant to flexibility provisions provided in section 5 of version 1.0 of the Reversals Standard, and because the A6.4ERs contributed to the reversal risk buffer pool account are expected to be immediately cancelled pursuant to draft methodologies recommended by the MEP. As a result, the MEP notes that uncertainty related to the selection of the disturbance and climate scenarios does not have any implications for the solvency of the reversal risk buffer pool account (as indicated in paragraph 75 of this cover note).
38. The MEP was unable to identify any examples of jurisdiction-wide natural reversal risk mitigation measures at the subnational, national, or multi-national levels. Accordingly, the MEP determined that natural reversal risk mitigation factors for activities that reduce non-renewable biomass consumption should be set to zero by default. They are therefore not included in the calculation of natural reversal risk ratings in this version of the draft methodological tool (see paragraph 22 of this draft methodological tool).
39. In considering how its proposed approach compares to best practices in other settings, the MEP assessed but was unable to identify any explicit data and methods used to determine natural reversal risk factors in other carbon crediting mechanisms. The MEP also observes that the academic literature includes findings that buffer pools in some existing carbon crediting programs may not be adequately sized and do not reflect geographic variation in natural reversal risks.¹⁸

3.5.3. Human-induced reversal risks

40. Unlike natural reversal risks, for which historical data and forward-looking biophysical modelling can provide reliable analytical insights, human-induced reversal risks depend

¹⁷ See <https://doi.org/10.1038/s41586-026-10571-y>.

¹⁸ See, e.g., Anderegg, W.R.L. et al. (2025), Current Forest Carbon Offset Buffer Pool Contributions Do Not Adequately Insure Against Disturbance-Driven Carbon Losses, *Global Change Biology* 31, e70251, <https://doi.org/10.1111/gcb.70251>; Haya, B.K. et al. (2023), Comprehensive review of carbon quantification by improved forest management offset protocols, *Frontiers in Forests and Global Change*, 6, 958879, <https://doi.org/10.3389/ffgc.2023.958879>; Wu, C. et al. (2026), Forest carbon protocols underestimate climate-driven carbon loss risks, *Nature* 654, 107-113, <https://doi.org/10.1038/s41586-026-10571-y>.

on a variety of factors that may depart substantially from historical conditions. The MEP was unable to identify any peer-reviewed studies or other analytical literature that provided a clear empirical or analytical basis for projecting human-induced reversal risks, assessing human-induced reversal risk mitigation measures, or estimating associated reversal risk reduction factors. Accordingly, the MEP deliberated these matters and agreed to recommend an approach, as explained in the following subsections.

41. For human-induced reversal risks, the draft tool provides:
- (a) A single default factor for human-induced reversal risk factors that applies to all Article 6.4 projects or CPs implemented in any of the countries listed in the fNRB Tool (see section 3.5.3.1.1 of this cover note); and
 - (b) Three reversal risk mitigation actions and associated reversal risk reduction factors that are evaluated at the national level, based on the host Party of each Article 6.4 project or CP (see sections 3.5.3.1.2 and 3.5.3.1.3 of this cover note).

3.5.3.1 Human-induced reversal risk factors

3.5.3.1.1 Historical information on human-induced carbon stock losses

42. Activities reducing the consumption of non-renewable biomass may affect carbon stocks in different types of land; however, most of the carbon is assumed to be preserved on forest land in estimating fNRB values (see paragraph 86 of this cover note). This section evaluates information on historical data on carbon stock losses due to human interventions in forests, based on data on forest cover loss provided by Sims et al. (2025), based on the Global Forest Watch data series (Hansen et al. 2013).^{19,20} These data include losses due to both deforestation and forest degradation, which are both relevant in this context.
43. A particular feature of the Sims et al. (2025) dataset is that it provides information on different causes of forest carbon losses, including natural and human-induced causes,²¹ whereas other data sources (e.g., Vancutsem et al. 2021) only provide deforestation and forest degradation data without identifying their causes.²²
44. To inform its deliberations about future human-induced carbon stock losses, the MEP, in consultation with the secretariat, analysed historical rates of human-induced tree cover losses from the years 2000 through 2025. The MEP compared data on forest cover loss (measured in hectares per year) over time and expressed the result across time periods as a per cent of forest cover loss relative to 2000 levels (see Table 1). In addition, the MEP calculated the average historical annual forest cover loss over the period 2020 to 2025, expressed as a per cent of 2000 levels lost per year, and determined the total tree cover

¹⁹ Sims, M.J. et al. (2025). Global drivers of forest loss at 1 km resolution. *Environmental Research Letters*, 20, 074027. <https://doi.org/10.1088/1748-9326/add606>.

²⁰ Hansen, M.C. et al. (2013). High-Resolution Global Maps of 21st-Century Forest Cover Change. *Science*, 342, 850-853. <https://doi.org/10.1126/science.1244693>.

²¹ The analysis here excludes the drivers of tree cover loss labeled “Wildfire” and “Other natural disturbances” in the Sims et al. (2025) data and defines the remaining drivers, including “unclassified”, collectively as “human-induced” drivers of tree cover loss.

²² Vancutsem, C. et al. (2021). Long-term (1990-2019) monitoring of forest cover changes in the humid tropics. *Science Advances*, 7, eabe1603. <https://doi.org/10.1126/sciadv.abe1603>.

loss if that average historical loss rate would continue for 100 years, without accounting for forest regrowth rates.

Table 1. Historical human-induced tree cover losses and the projected loss if historical rates would continue for 100 years in per centage

Series	Asia & Pacific	Latin America & Caribbean	Sub-Saharan Africa	Average across all regions
Forest cover loss, 2001-2010 versus 2000	4.76	4.64	2.78	4.30
Forest cover loss, 2011-2020 versus 2000	6.90	4.42	6.38	5.61
Forest cover loss, 2001-2025 versus 2000	14.55	11.1	12.51	12.49
Average annual loss, 2001-2025 versus 2000	0.58	0.44	0.50	0.50
Projected 100-year loss versus 2000	58.22	44.45	50.03	49.98

Source: analysis by MEP and secretariat based on Sims et al. (2025).

45. The data and analysis have several important caveats:

- (a) The location of where carbon stock losses occur within a jurisdiction varies greatly. Human-induced carbon stock losses are much higher in places nearby human settlements or nearby roads, rather than in areas with little or no human interference. Areas with human interference are also those where biomass for cooking is sourced from. For this reason, the risks of human-induced losses of carbon stocks that were preserved due to reducing the consumption of non-renewable biomass could be significantly higher than the average human-induced losses across a jurisdiction; and
- (b) The underlying data is associated with significant uncertainty, inter alia due to the interpretation of satellite imagery and uncertainty in the methods used to estimate carbon stock losses. In particular, the data may not provide for time consistency, as both remote sensing techniques and methods to estimate carbon losses changed over time (Pendrill et al. 2022).²³ Moreover, the suitability of data for time-series analysis is limited due to improvements to the method for detecting tree cover loss applied over time (Weisse und Potapov 2021; Pendrill et al. 2022).²⁴

46. The MEP noted that it may not be appropriate to assume that these trends will continue, as discussed in the next subsection, but agreed that this analysis could be helpful to inform its deliberations with an empirically grounded benchmark.

²³ Pendrill, F. et al. (2022). Disentangling the numbers behind agriculture-driven tropical deforestation. *Science*, 377, eabm9267. <https://doi.org/10.1126/science.abm9267>.

²⁴ Weisse, M. and Potapov, P. (2021). Assessing Trends in Tree Cover Loss Over 20 Years of Data. Global Forest Watch. <https://www.globalforestwatch.org/blog/data-and-tools/tree-cover-loss-satellite-data-trend-analysis/>.

3.5.3.1.2 Are past human-induced carbon stock losses a good proxy for the future?

47. The above data showed that human-induced carbon stock losses were significant over the past 25 years. Nevertheless, there are different reasons to assume that future human-induced carbon stock losses could be lower than in the past and that human-induced deforestation and forest degradation may ultimately be halted and reversed:
- (a) While the GFW data does not show a clear trend in forest cover loss over time, data compiled by the Food and Agricultural Organization of the United Nations (FAO) on deforestation based on data reported by countries (FAO 2025) and remote sensing data compiled by the Joint Research Centre (JRC) of the European Union on deforestation and forest degradation in tropical moist forests show some trend that global deforestation has been declining over a longer time horizon of decades (Table 2 and Source: FAO (2025)). Data from 112 countries for which entries were available for all five time periods.
 - (b) Table 3 note that neither of these two additional data sources differentiates between human-induced deforestation and natural disturbances that involve deforestation and that these two data differ in several aspects from the GFW data, including the parameter to measure forest losses, data sources and algorithms to derive loss estimates; and²⁵
 - (c) Several governments and non-governmental actors have committed to slowing and ultimately halting deforestation, such as in the New York Forest Declaration and the Glasgow Leaders' Declaration on Forest and Land Use. Several countries have also communicated NDCs and LT-LEDS that address the forest sector, in addition to countries that have implemented elements referred to in paragraph 71 of decision 1/CP.16, as further operationalized through relevant decisions comprising the Warsaw Framework for Reducing Emissions from Deforestation and forest Degradation (REDD)-plus. This could support the implementation of policies that slow deforestation and forest degradation.

Table 2 Annual rate of deforestation reported by FAO for 112 countries

Period	Average annual rate of deforestation (million hectares per year)
1990 – 2000	15.0
2000 – 2010	11.8
2010 - 2015	8.5
2015 - 2020	8.2
2020 - 2025	7.9

Source: FAO (2025). Data from 112 countries for which entries were available for all five time periods.

²⁵ The MEP notes that one possible reason for differences in trends between the GFW data on the one hand and the FAO and JRC data on the other hand could be changes in the algorithm implemented over time to derive forest cover loss in the GFW data. Furthermore, the GFW data includes forest cover loss which may differ from deforestation data.

Table 3 **Total deforestation of tropical moist forest (direct and after degradation) for 65 developing countries reported by JRC**

Period	Average annual rate of deforestation (million hectares per year)
1990 – 1994	5.4
1995 - 1999	10.0
2000 - 2004	9.4
2005 - 2009	5.9
2010 - 2014	5.5
2015 - 2019	4.6
2020 - 2024	3.3

Source: JRC (2025). Note that only developing countries are included by the MEP in this analysis.

48. On the other hand, many countries are lacking finance to implement policies to reduce deforestation and forest degradation. Moreover, it is uncertain how key drivers for human-induced deforestation, such as prices for agricultural commodities and demand for biofuels, will develop in the future. These considerations could lead to ongoing or even increasing deforestation pressure, despite some signs of a slowing rate of deforestation in the data discussed above.
49. It is important to note that estimates of human-induced reversal risk are therefore a judgment of how the future may unfold. The MEP agreed, as a matter of expert judgment, that it is reasonable to assume that efforts to slow deforestation and forest degradation will continue and that future human-induced carbon losses will be lower than past losses. The MEP also noted that, because the historical trends and forward-looking projections analysed in Table 1 do not account for forest regrowth dynamics, it would be appropriate to select a default value that is lower than the percentage losses reported in in Table 1 and to include this methodological feature into the determination of a selected default value.
50. Drawing on the data and analysis documented here, the MEP agreed to recommend that the Supervisory Body select a value for the human-induced reversal risk factor between 20 per cent and 45 per cent (see paragraph 24 in the draft methodological tool). The MEP noted that, although there may be substantial variation in country-level trends, the selection of a single default parameter would be appropriate because assigning national- or multi-national-level trends would introduce additional uncertainties.
51. The MEP noted this recommended range is based on expert judgment, including the following considerations:
 - (a) The upper limit of 45 per cent reflects the MEP's judgment that, while it is possible that future human-induced deforestation and forest degradation increases in the future, it is reasonable to assume that deforestation and forest degradation will decline over time (see paragraph 49 of this cover note). As indicated above in Table 1, the average tree cover loss for all countries covered by the fNRB Tool is about 0.5 per cent; and this rate, if continued for 100 years, would lead to a loss of about 50 per cent of tree cover levels in 2000. While the MEP did not attempt to translate tree cover loss into carbon stock calculations, the MEP agreed that it was reasonable to treat this extrapolation as a proxy for losing about 50 per cent of carbon stocks over a 100-year period. While the MEP noted that relative tree cover losses are likely higher in areas where non-renewable biomass is harvested, as compared to average country losses, the MEP still concluded that it is reasonable

to assume that the upper limit of future losses in the context of clean cooking activities would be lower than 50 per cent (such as the recommended upper limit of 45 per cent); and

- (b) The lower limit of 20 per cent reflects the MEP's judgment that, while it is difficult to quantitatively estimate expected future carbon-stock losses, assuming that losses will automatically be much lower than recently would not be well justified. Although MEP does not have a specific evidentiary basis to recommend a lower bound, the MEP agreed that a reasonable lower limit would be about 20 per cent.
52. It is also important to emphasize that, while the selection of a default value is subject to significant uncertainty and involves policy judgments, the MEP agreed that human-induced reversal risks are material and non-zero. In other words, while the selection of any one parameter is fundamentally uncertain, the conclusion that the number is significantly higher than zero per cent is robust (as reflected in the proposal to adopt a lower-bound for this parameter that is greater than zero).

3.5.3.2 Human-induced reversal risk mitigation actions

53. Although a wide range of actions could plausibly reduce human-induced reversal risk factors, the MEP determined that considering a narrower list would be more appropriate based on practical considerations, including sensitivity to transaction costs for activity participants. As noted above, the application of this methodological tool to Article 6.4 activities that reduce non-renewable biomass consumption relies on the selection of default values that are straightforward to apply in practice. In order to reduce validation and verification costs, the MEP agreed to recommend the use of objective criteria that can easily be confirmed and that do not rely on the judgment of activity participants or designated operational entities (DOEs). In contrast, reversal risk mitigation actions that depend on subjective assessments (e.g., evaluations of the effectiveness of individual government policies) risk introducing conflicting approaches and higher validation and verification costs.
54. The MEP notes that NDC, LT-LEDS, and REDD-plus submissions frequently reference measures addressing natural reversal risks (e.g., wildfire prevention and pest and disease management) alongside efforts to reduce deforestation and forest degradation. However, the MEP was unable to identify evidence concerning the implementation of these measures at the jurisdictional level. Given that human-induced activities have historically been the dominant driver of deforestation and forest degradation, the MEP determined that, at this time, it is appropriate to apply these reversal risk mitigation actions solely to human-induced reversal risk factors. Accordingly, MEP identified three reversal risk mitigation actions:
- (a) **NDC submissions** (see paragraph 26 of the draft methodological tool). Human-induced reversal risks are expected to be lower when a host Party has an NDC that includes land use, land-use change, and forestry (LULUCF). To ensure that an NDC can be expected to reduce human-induced reversal risk factors, this reversal risk reduction measure requires activity participants to demonstrate that the host Party of the Article 6.4 project or CP has an NDC that includes the LULUCF sector and that the host Party has communicated a biennial transparency report that covers LULUCF emissions and removals and that is sufficient to track progress toward the host Party's NDC;
 - (b) **LT-LEDS submissions** (see paragraph 27 of the draft methodological tool). Human-induced reversal risks are expected to be lower when a host Party has

submitted an LT-LEDs that includes the objective of halting and reversing deforestation. Because such an objective can build on and extend expected benefits associated with an NDC target that includes the LULUCF sector, it is included as a distinct reversal risk mitigation measure that can be achieved separately from the reversal risk mitigation measure for an applicable NDC submission; and

- (c) **REDD-plus measures** (see paragraph 28 of the draft methodological tool). Human-induced reversal risks are expected to be lower when a host Party has implemented the four elements referred to in paragraph 71 of decision 1/CP.16, as further operationalized through relevant decisions comprising the Warsaw Framework for REDD-plus, including a) a national REDD-plus strategy or action plan, b) a national forest monitoring system, 3) a forest reference emissions level or forest reference level, and d) a safeguard information system. In recognition that some Parties have implemented some, but not all, of the above, this reversal risk mitigation action justifies a higher reversal risk reduction factor when all four elements are satisfied and also awards partial credit in the form of a proportionately smaller reversal risk reduction factor when less than four elements are satisfied.

- 55. The selected reversal risk mitigation actions focus on outcomes that can be objectively identified under the UNFCCC at the host-Party level. Because the reversal risk mitigation actions identified in the methodological tool are not legally mandated for Parties, it is important to clarify that their inclusion here is not intended to establish a precedent for requiring the adoption of voluntary practices or conditioning participation in the Article 6.4 mechanism on voluntary practices outside of the Article 6.4 mechanism itself. Instead, the reversal risk mitigation actions identified here have the sole purpose of recognizing their associated benefits in terms of reversal-risk reduction. In addition, they have the practical effect of lowering the number of A6.4ERs that are contributed to the reversal risk buffer pool account (i.e., increasing the number of A6.4ERs issued to activity participants), such that their inclusion does not have a detrimental effect on Parties or activity participants.

3.5.3.3 Human-induced reversal risk reduction factors

- 56. The MEP agreed to recommend a functional form for calculating human-induced reversal risk ratings by multiplying the human-induced reversal risk factor by one minus the sum of applicable reversal risk reduction factors (see equation (3) in the draft methodological tool). This kind of multiplicative functional form means that the “gross” reversal risk characterized by the reversal risk factor is reduced to a “net” reversal risk rating according to reversal risk factors, which can reduce the “gross” risk by as little as 0 per cent (if no reversal risk mitigation actions apply or if the reversal risk reduction factors are all set to zero) and as much as 100 per cent (if applicable reversal risk mitigation actions are present and their associated reversal risk factors sum to 100 per cent).
- 57. The MEP noted that it was unable to identify any evidence to characterize the efficacy of the reversal risk mitigation actions identified above, which is to be expected as there has been limited time over which to assess the effect of NDC and LT-LEDs submissions as well as many confounding factors that may affect evaluations of the implementation of REDD-plus measures. As a result, there was limited evidence available to inform an expert judgment about the range of potential reversal risk reduction factors.
- 58. Considering the limited information available to inform the selection of reversal risk reduction factors, the MEP agreed that it was appropriate to recommend a relatively broad range that excludes values at the lower and upper bound of this range. Furthermore, the MEP agreed that it was appropriate to recommend a range of values for the sum of all

reversal risk reduction factors together, rather than to make recommendations about individual reversal risk reduction factors.

59. The MEP agreed to recommend that the Supervisory Body:
- (a) Select values for human-induced reversal risk reduction factors that sum to between 20 per cent and 80 per cent; and
 - (b) Determine how to allocate the sum across individual human-induced reversal risk reduction factors (see Table 2 in the draft methodological tool).
60. The MEP noted this recommended range is based on expert judgment, including the following considerations:
- (a) The upper limit of 80 per cent reflects the MEP's judgment that, while reversal risk mitigation actions are expected to reduce human-induced reversal risks, it is unlikely that the implementation of NDC, LT-LEDS, and REDD-plus submissions would eliminate human-induced reversal risks. Therefore, it is reasonable to recommend an upper limit on the sum of human-induced reversal risk reduction factors; and
 - (b) The lower limit of 20 per cent reflects the MEP's judgment that, while it lacks a basis to recommend a parameter based directly on data or evidence, it is unlikely that the implementation of NDC, LT-LEDS, and REDD-plus submissions would have no impact on human-induced reversal risks. Therefore, it is reasonable to recommend a lower limit on the sum of human-induced reversal risk reduction factors, noting that these factors only apply where activity participants demonstrate that the relevant reversal risk mitigation actions are present in the host Party of the Article 6.4 project or CP.

3.5.4. Recommendations on the selection of human-induced reversal risks and reversal risk reduction factors

61. As discussed above, the MEP agreed to recommend that the Supervisory Body consider selecting default values from the following ranges and for the following parameters:
- (a) Between 20 and 45 per cent for human-induced reversal risk factor; and
 - (b) Between 20 and 80 per cent for the sum of all reversal risk reduction factors.
62. The MEP recommends that the Supervisory Body select these values in conjunction with one another, rather than independently, as some combinations of potential default factors may not be consistent with the analysis and reasoning behind the MEP's recommended ranges. The Supervisory Body could, for example, consider the following combinations:
- (a) A relatively optimistic default value for the human-induced reversal risk factor (i.e., closer to 20 per cent) and a relatively pessimistic default value for the sum of all reversal risk reduction factors (i.e., closer to 20 per cent); and
 - (b) A relatively pessimistic default value for the human-induced reversal risk factor (i.e., close to 45 per cent) and a relatively optimistic default value for the sum of all reversal risk reduction factors (i.e., closer to 80 per cent).
63. The MEP notes the following observations:

- (a) A relatively optimistic default value for the human-induced reversal risk factor (i.e., closer to 20 per cent) and a relatively pessimistic default value for the sum of all reversal risk reduction factors (i.e., closer to 20 per cent) would:
 - (i) Require an Article 6.4 project or CP located in a host Party that has not implemented any of the reversal risk reduction actions identified above to make a smaller buffer pool contribution and receive a larger number of A6.4ERs. This would be a benefit to Article 6.4 projects or CPs in this category;
 - (ii) Require an Article 6.4 project or CP located in a host Party that has implemented all of the reversal risk reduction actions identified above to make a larger buffer pool contribution and receive a smaller number of A6.4ERs. This would be a drawback to Article 6.4 projects or CPs in this category; and
 - (iii) Make more sense if one is relatively more confident in optimistic assumptions about future deforestation risks without the implementation of NDC, LT-LEDS, and REDD-plus submissions than in the efficacy of these same measures in reducing deforestation risks; and
 - (b) A relatively pessimistic default value for the human-induced reversal risk factor (i.e., close to 45 per cent) and a relatively optimistic default value for the sum of all reversal risk reduction factors (i.e., closer to 80 per cent) would:
 - (i) Require an Article 6.4 project or CP located in a host Party that has not implemented any of the reversal risk reduction actions identified above to make a larger buffer pool contributions and receive a smaller number of A6.4ERs. This would be a drawback to Article 6.4 projects or CPs in this category;
 - (ii) Require an Article 6.4 project or CP located in a host Party that has implemented all of the reversal risk reduction actions identified above to make a smaller buffer pool contribution and receive a larger number of A6.4ERs. This would be a benefit to Article 6.4 projects or CPs in this category; and
 - (iii) Make more sense if one is relatively more confident that the implementation of NDC, LT-LEDS, and REDD-plus submissions will be effective in reducing deforestation risks than that deforestation rates in the absence of these measures will be significantly lower than has been observed in recent decades.
64. In both cases, these scenarios avoid making optimistic assumptions about both factors at the same time. Making optimistic assumptions about both factors would not be well justified because optimism about the extent of reducing global deforestation trends risks conflation with optimistic expectations about the positive impact of the implementation of NDC, LT-LEDS, and REDD-plus submissions, such that this approach would effectively “double count” the same fundamental drivers of lower human-induced reversal risk ratings.
65. In contrast, while it might be internally consistent to make pessimistic assumptions about both human-induced reversal risk factors (i.e., closer to 45 per cent) and human-induced reversal risk reduction factors (i.e., closer to 20 per cent) — and it is possible that these assumptions could be justified in light of the concerns identified in paragraph 0 — the rationale behind such a selection would conflict with the potential for optimism identified

in paragraph 50. Such an approach would also lead to a relatively higher number of A6.ERs being contributed to the Reversal Risk Buffer Pool Account and a relatively lower number of A6.4ERs being issued to activity participants.

66. Finally, the MEP notes that it considered how best to contribute its expertise as a technical body to address the mandates provided by the Supervisory Body and agreed to recommend a structure for determining human-induced reversal risk ratings that is responsive both to the fundamental drivers of land use change as well as the potential for long-term policies and trends to contribute to better outcomes in the future. In producing these recommendations, the MEP intends to provide technical advice to inform the Supervisory Body's deliberations, including recommendations based on expert judgment and inferences drawn from technical evidence, while noting that the final selection of default values also includes explicit policy judgments.

3.6. Calculation of $F_{buffer,i,t}$

67. Calculating $F_{buffer,i,t}$ requires a procedure to combine the reversal risk ratings for natural reversal risks and human-induced reversal risks. The MEP notes that the appropriate procedure for combining these parameters depends on how the parameters are selected and whether they are statistically independent of one another.
68. The MEP considered the nature of the selection of natural and human-induced reversal risks, as well as stakeholder input, and concluded that it is reasonable to assume that, for the purposes of the values adopted in the draft methodological tool, natural and human-induced reversal risks are statistically independent.
69. Nevertheless, to accommodate the possibility that future updates to the draft tool could provide alternative approaches to selecting natural or human-induced reversal risks, the MEP agreed to include a factor in equation (1) of the draft methodological tool that accounts for the potential for statistically dependent outcomes (see paragraph 17 of the draft methodological tool). This factor is set to zero in the draft methodological tool by assumption but could be modified in future updates to reflect any changes to the approach adopted in the draft methodological tool or any additional evidence about the statistical relationship between natural and human-induced reversal risks.

3.7. Maximum reversal risk ratings

70. As referenced above in paragraph 5(a) of this cover note, the Supervisory Body has mandated the MEP to recommend whether upper limits are needed for the overall reversal risk rating or specific risk factors. The MEP understands that an upper limit would restrict eligibility by prohibiting Article 6.4 activities from earning A6.4ERs where their overall reversal risk rating or applicable reversal risk factor exceeds such a limit.
71. The MEP proposes to not recommend or apply an upper limit for reversal risk ratings for activities that reduce non-renewable biomass consumption, without prejudice to what the MEP might recommend with respect to future applications of this draft methodological tool to other Article 6.4 activity types.

3.8. Considerations related to the Reversal Risk Buffer Pool Account

72. The MEP proposes to assign default values in the draft methodological tool for reversal risk factors and, where applicable, reversal risk reduction factors. The MEP notes that the

choice of default values has implications for the operation of the reversal risk buffer pool account as well as the economics of Article 6.4 activity development:

- (a) Where reversal risk assessments determine buffer pool contributions that are lower than is necessary to compensate for Article 6.4 activities' actual reversal risk, this poses the risk that the reversal risk buffer pool account will not be able to cover the reversals and may become insolvent; and
 - (b) Where reversal risk assessments determine buffer pool contributions that are higher than is necessary to compensate for Article 6.4 activities' actual reversal risk, this will increase the cost of generating A6.4ERs and potentially discourage the development of Article 6.4 activities.
73. As indicated in section 3.1.1 of the draft "Concept note: Options for the implementation of paragraph 62 of version 1.0 of the "Standard: Requirements for activities involving removals under the Article 6.4 mechanism" (A6.4-MEP014-A08) (hereinafter referred to as the "draft Concept Note on Paragraph 62"), the Supervisory Body has not yet determined the level of confidence that the Supervisory Body seeks to establish in making a determination that the assets of the reversal risk buffer pool account are sufficient to cover its liabilities.²⁶
74. The MEP notes that determining the intended level of confidence in the reversal risk buffer pool account would be helpful to guide the determination of reversal risk ratings. In the context of Article 6.4 activities that reduce non-renewable biomass consumption, however, this determination may not be necessary to guide the determination of reversal risk ratings because mechanism methodologies for this Article 6.4 activity type are expected to:
- (a) Not require activity participants to monitor, report, or remediate any reversals that may occur, pursuant to flexibility provisions provided in section 5 of version 1.0 of the Reversals Standard; and
 - (b) Require that A6.4ERs contributed to the reversal risk buffer pool account are to be immediately cancelled.
75. The MEP notes that when both conditions in paragraph 74 of this cover note are met, uncertainty related to the selection of the disturbance and climate scenarios does not have any implications for the solvency of the Reversal Risk Buffer Pool Account.
- 3.9. Guidance on negligible reversal risks**
76. Paragraph 3(g) of version 1.0 the Reversals Standard defines a negligible risk of reversal as follows:
- "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, calculated over a 100-year timeframe starting from no earlier than the end of the last active crediting period".*
77. MEP notes that the Reversals Standard directs mechanism methodologies to define a negligible risk of reversal, expressed as a maximum percentage and based on guidance

²⁶ See <https://unfccc.int/sites/default/files/resource/A6.4-MEP014-A08.pdf>.

provided in the draft methodological tool. However, the MEP also notes that such guidance might not be relevant to activities that reduce non-renewable biomass consumption. A determination that an Article 6.4 activity has a negligible risk of reversal is primarily relevant where an Article 6.4 activity seeks to terminate post-crediting monitoring obligations, consistent with paragraph 28(a) of version 1.0 of the Removals Standard and section 4.2.2 of version 1.0 of the Information Note. Under paragraphs 13 and 15 of version 1.0 of the Reversals Standard, however, mechanism methodologies addressing non-renewable biomass consumption may request alternatives to post-crediting monitoring. If a mechanism methodology proposed an exemption from this requirement and the Supervisory Body approved that exemption, as is expected for mechanism methodologies that reduce the consumption of non-renewable biomass, there would be no practical need for an activity participant to demonstrate that the corresponding Article 6.4 activity has a negligible risk of reversal.

78. The MEP also notes that paragraph 39(b) of version 1.0 of the Removals Standard requires the reversal risk rating derived from the draft methodological tool to “inform the identification of A6.4ERs with a negligible risk of reversal” and that any such A6.4ERs be “tagged” accordingly in the mechanism registry. If a mechanism methodology does not provide a definition of a negligible risk of reversal, then no A6.4ERs issued under that mechanism methodology will be tagged as such in the mechanism registry.
79. This draft methodological tool may be updated in the future to provide additional guidance relevant to the determination of a negligible risk of reversal. In the meantime, the draft methodological tool can be used to calculate a reversal risk rating for Article 6.4 activities that reduce non-renewable biomass consumption.

3.10. Summary of public comments addressed in the recommendation by the MEP

3.10.1. General comments

80. The MEP noted that clean cooking and other activities that reduce non-renewable biomass consumption are distinct from many other activity types because they involve project- or PoA-scale considerations for the implementation of Article 6.4 activities, yet are credited, in part, based on changes in the consumption of fuelwood or charcoal sourced from a broader geographic region (e.g., a sub-national or national boundary). In contrast, other activity types, such as forestry activities, may involve either geographic scale but generally do not involve a combination of both scales.
81. The MEP noted that the proposed approach to address reversal risks for activities that reduce non-renewable biomass consumption focuses on reversal risks in the broader geographic areas from which fuelwood or charcoal are produced, rather than on the geographically narrower locations where technologies to reduce non-renewable biomass consumption (e.g., cleaner cookstoves) are deployed.

3.10.2. Natural reversal risks

82. Several comments referenced natural reversal risk assessment practices in other carbon crediting mechanisms and recommended that the MEP consider or adopt these approaches. Neither the MEP nor any stakeholder comments identified explicit data or methods used to determine natural reversal risk factors in other carbon crediting mechanisms; similar observations were made by two external experts retained by the secretariat during the development of the draft tool. The MEP also took note of peer-reviewed studies finding that these practices likely underestimate natural reversal risks (see paragraph 39 of this cover note).

83. Several comments supported the development of empirically based reversal risk factors in general or the specific approach proposed for calculating natural reversal risk factors in the draft tool. The MEP took note of these comments.
84. Several comments requested that the MEP publish additional values to reflect uncertainty across the other disturbance and climate scenarios considered but not adopted for calculating the default values for natural reversal risk factors. The MEP agreed to publish data files containing the full range of climate and disturbance scenarios considered for natural reversal risks in appendix 3.
85. Several comments described the proposed approach to calculating natural reversal risk factors as too novel or insufficiently supported in the peer-reviewed literature and recommended against its use. The MEP noted that:
- (a) No stakeholder comments identified alternative approaches for calculating empirically derived natural reversal risks. Although some comments made generic recommendations to adopt approaches used in other carbon crediting mechanisms, the MEP was unable to identify any explicit data or methods used to determine natural reversal risk factors in other carbon crediting mechanisms and took note of peer-reviewed studies finding that these practices likely underestimate natural reversal risks (as indicated above in paragraph 82 of this cover note). The MEP therefore concluded that the best available scientific evidence supported an alternative approach; and
 - (b) The peer-reviewed evidentiary basis for the proposed natural reversal risk factors is comparable to that used for the calculation of default values in the fNRB Tool. The Modelling Fuelwood Savings Scenarios (MoFuSS) model is used to generate fNRB values, which mechanism methodologies use to quantify the total number of A6.4ERs to be issued with respect to fuelwood or charcoal savings using a percentage-based parameter that reflects the share of fuel consumption produced from non-renewable biomass sources.²⁷ The MoFuSS model has been peer-reviewed in several scientific publications, but the numerical results adopted as default parameters in the fNRB Tool are not the product of a specific peer-reviewed scientific publication. Similarly, the technical methods used to calculate natural reversal risk factors in this methodological tool is based on several peer-reviewed scientific papers, even though the specific set of results proposed as default parameters in Appendix 1 is not the product of a specific peer-reviewed scientific publication. In both cases, the MEP concluded that:
 - (i) Peer-reviewed scientific methods provide a reasonable approach to quantifying default parameters for methodological tools, particularly in the absence of peer-reviewed alternatives; and
 - (ii) It is appropriate to rely on numerical results produced from peer-reviewed models and methods, even if those results are not the product of a specific peer-reviewed scientific publication.
86. Several comments referenced the calculation of natural reversal risks being derived from an analysis of forests but noted that fuelwood and charcoal are harvested both from forests and from other ecosystem types, such as shrublands or rangelands. The MEP clarified that, as described in Appendix 2, the calculation of natural reversal risks is based in part on a determination of the historical frequency of disturbances from satellite data. This

²⁷ See <https://www.mofuss.unam.mx/>.

calculation is performed on grid cells with canopy cover of at least 10 per cent, based on a standard FAO forest definition.²⁸ As suggested, other relevant ecosystem types, including shrublands or rangelands, are associated with canopy cover of less than 10 per cent. However, the MEP notes that the proposed approach does not exclude reversal risks that apply in these ecosystems. The natural reversal risk factors calculated here apply the frequency determined based on grid cells with canopy cover of at least 10 per cent to all above-ground woody biomass in the applicable jurisdiction. The MEP notes that this assumption is associated with uncertainty, as the frequency of disturbances can differ across ecosystem types that are not included in the sample (e.g., there may be higher wildfire frequencies in savannas than in moist tropical forests), but that the quantitative implications of any discrepancies may be moderated because above-ground woody biomass is concentrated in grid cells with higher canopy cover percentages. The MEP observes that research to better characterize historical disturbance rates across a broader range of ecosystem types would be helpful to inform future updates.

87. Several comments noted that natural reversal risks could be informed by future scientific studies, including work that stakeholders indicated may be underway but is not yet published. Accordingly, some commenters suggested that the MEP should limit the validity of the draft tool to less than the typical 5-year period allowed by the Article 6.4 mechanism's procedures. The MEP took note of these comments and agreed that it would be beneficial to update the tool when additional relevant studies are published. The external expert consulted on the natural reversal risk parameters expressed a similar view and recommended an update in 2–3 years or potentially sooner, depending on the availability of new scientific publications (see section 5.3 of Appendix 2). The MEP further emphasized the importance of regularly updating the empirical basis for reversal risk parameters and included a recommendation to the Supervisory Body to provide a mandate to update the draft tool to address future scientific evidence that may emerge in the future (see paragraph 107 of this cover note). The MEP also agreed to retain the full 5-year validity period in its recommendation (see paragraph 3 of the draft tool). The MEP also noted that revisions to incorporate new evidence about natural reversal risks could plausibly increase or decrease reversal risk factors, depending on the nature of any new evidence.
88. Several comments raised questions about the selection of multi-national, national, and sub-national administrative boundaries in the draft methodological tool. The MEP noted that:
 - (a) The administrative boundaries included in the draft tool are aligned with those included in version 1.0 of the fNRB Tool (see section 3.4 of this cover note). Because the use of the fNRB Tool is required for all mechanism methodologies under development that apply to Article 6.4 activities reducing non-renewable biomass consumption, this alignment supports the implementation of all Article 6.4 activities that are eligible for crediting under draft mechanism methodologies for activities that reduce non-renewable biomass consumption. Furthermore, the MEP notes that the fNRB Tool applies only where mechanism methodologies provide guidance on the appropriate jurisdictional boundary(ies) to select, based on the profile(s) of displaced fuelwood or charcoal consumption, and the jurisdictional

²⁸ See, e.g., Food and Agriculture Organization of the United Nations 2023. Guidelines and Specifications, FRA 2025. Forest Resources Assessment Working Paper 193, <https://openknowledge.fao.org/server/api/core/bitstreams/40bef392-1ec8-441d-bd9a-f398f0a61a0a/content>.

boundaries are thus aligned with the reversal risks expected for the displacement of non-renewable biomass harvests; and

- (b) Natural reversal risk factors associated with other administrative boundaries were produced as part of the draft tool development process. These data could be applied to expand the draft tool's coverage to align with any additional jurisdictions included in future updates to the fNRB Tool.

89. Several comments raised specific questions about or commented on individual aspects of the data or methodology used to generate default reversal risk factors, including comments that:

- (a) Asserted that natural reversal risk factors in the draft methodological tool were derived from data focused on California or the United States and raised questions about the global applicability of localized results. The MEP clarified that, while the methodology used to calculate reversal risk factors was published in a peer-reviewed study that focused on natural reversal risks to forests in the continental United States, the natural reversal risk factors included in the draft tool were calculated by adapting region-agnostic methods to global data sources, rather than by interpreting results from a source specific to North America;
- (b) Suggested that the modelling of natural reversal risks does not account for post-disturbance forest growth. The MEP clarified that the modelling approach does account for post-disturbance forest growth (see section 3 of Appendix 2);
- (c) Proposed allowing Article 6.4 activities to determine individualized reversal risk factors and reversal risk ratings. The MEP took note of this comment but agreed to maintain a standardized approach to reversal risk assessment;
- (d) Referenced the draft methodological tool's use of a threshold of a 10 per cent loss in live biomass for the purpose of detecting historical reversals and expressed concern that this approach is not consistent with the Reversals Standard or is not sufficiently conservative because it will tend to estimate natural reversal risks that are lower than "true" values. The MEP clarified that the choice of a 10 per cent threshold reflects a technical consultant's expert judgment about the best approach to identify "true" reversals and therefore to avoid false positives (i.e., data that appear to indicate a "true" reversal but actually represent statistical imprecision in remote sensing data or temporary losses in forest carbon that would not constitute a reversal under paragraph 39 of version 1.0 of the Reversals Standard). As acknowledged in Appendix 2, this approach could potentially result in estimates of natural reversal risks that are lower than their "true" values. To the extent this results in a material departure, it is also consistent with the flexibility provided in paragraph 39 of version 1.0 of the Reversals Standard, which allows mechanism methodologies to deem modest but non-zero carbon losses not to be reversals when regrowth is conservatively expected to exceed small-scale disturbances for activity types that generate ongoing net removals without ongoing interventions from activity participants (e.g., for Article 6.4 activities involving forest carbon, such as activities that reduce non-renewable biomass consumption);
- (e) Referenced the draft methodological tool's focus on modelling the probability of high-severity disturbance events without incorporating reversals from low-severity disturbance events. The MEP clarified that its technical consultant identified this approach as the best available scientific method, given the challenge of robustly distinguishing low-severity historical events from statistical artifacts in estimated

forest biomass data derived from remote sensing, as well as an area for future research improvements. The MEP notes that most comments critiquing this methodological choice also recommended lower reversal risk factors or a non-empirical approach to reversal risk assessment, but observes that expanding the analysis to include low-severity disturbance events would be expected to increase calculated reversal risk factors.²⁹ Based on the recommendation of its technical consultant and the lack of alternative methods identified by the consultant or stakeholders, the MEP agreed that the focus on high-severity disturbance events is appropriate for an initial application of the draft methodological tool and is an area that should be addressed by future research to inform an update to the draft methodological tool;

- (f) Raised concerns related to the use of climate data from the Climate Model Intercomparison Project Phase 6 (CMIP6),³⁰ including:
 - (i) Criticisms that the method for calculating the 100-year time horizon of the natural reversal risk analysis used climate data for two decades (the 2080s and 2090s) as a proxy for climate data for the 2100s and 2110s. The MEP clarified that the CMIP6 data only include climate data through 2100, such that it is necessary to use a proxy data source for the last 20 years of a 100-year analytical period beginning in 2020. The MEP noted that its technical consultant selected the most recent projected climate data as the best available alternative and agreed that this was a reasonable choice; and
 - (ii) Criticisms that the analytical method does not rely on data from the newer Climate Model Intercomparison Project Phase 7 (CMIP7) climate model comparison project.³¹ The MEP notes that the scientific paper describing CMIP7 results was only recently published in April 2026.³² Because secondary data products take time to produce following the publication of new CMIP results, including downscaled climate data and other derivative data products used to project climate-related reversal risks, the MEP noted that it was reasonable to rely on data products developed using CMIP6 results pending the development of updates that rely on CMIP7. The MEP observes that this is an area where future scientific publications could provide a basis for updating natural reversal risk factors; and
- (g) Recommended that the MEP adopt reversal risk reduction factors for natural reversal risks at the jurisdictional scale. The MEP noted that neither the MEP nor any stakeholders were able to identify any examples of jurisdictional-scale reversal risk reduction actions or reversal risk reduction factors. The MEP also took note of examples provided by stakeholders of activity-level reversal risk mitigation measures, which would be relevant to consider for other activity types. The MEP agreed not to include jurisdictional-scale reversal risk reduction factors for natural risks in this version of the draft methodological tool, without prejudice to any future

²⁹ One comment recommended that the MEP recommend higher reversal risk factors to account for this methodological feature, which is consistent with the expected effect of any such methodological expansion.

³⁰ See <https://wcrp-cmip.org/cmip-phases/cmip6/>.

³¹ See <https://wcrp-cmip.org/cmip-phases/cmip7/>.

³² Detlef van Vuuren et al., The Scenario Model Intercomparison Project for CMIP7 (ScenarioMIP-CMIP7), *Geoscientific Model Development* 19, 2627-2656, <https://doi.org/10.5194/gmd-19-2627-2026>.

updates, including applications of the draft methodological tool to different activity types (e.g., those where activity participants exercise control over applicable greenhouse gas reservoirs).

3.10.3. Human-induced reversal risks and reversal risk reduction factors

90. The MEP noted that, although several comments made conceptual suggestions or recommendations on approaches for quantifying human-induced reversal risks or reversal risk reduction factors, no comments identified a specific quantitative estimate or method for calculating empirically derived values. As indicated in the initial draft methodological tool for public consultation, the MEP was also unable to identify any specific data sources or approaches.
91. The MEP agreed to address human-induced reversal risks, human-induced reversal risk mitigation actions, and human-induced reversal risk reduction factors as explained in section 3.5.3 of this cover note.

3.10.4. Combining natural and human-induced reversal risk ratings

92. The MEP received several comments that characterized natural and human-induced reversal risks as statistically independent as well as several comments that characterized them as statistically dependent. The MEP noted that stakeholders were asked for input on this question as a general matter and without a specific proposal from the MEP on how to address human-induced reversal risk assessment (as the draft methodological tool released for public consultation at MEP 014 did not include a proposal for how to determine human-induced reversal risk factors, human-induced reversal risk mitigation actions, or human-induced reversal risk reduction factors).
93. As indicated in section 3.5.3 of this cover note, the MEP agreed to recommend an approach to determining these factors in the draft methodological tool. The MEP agreed that it would be appropriate to combine natural and human-induced reversal risk ratings by adding them together and agreed to include a term to describe potential statistical dependency that would be set to zero as a default in the draft methodological tool to accommodate the possibility that new evidence could warrant a change in the proposed approach, as indicated in section 3.6 of this cover note.

3.10.5. Upper limit on reversal risk ratings

94. Several comments recommended that the MEP set an upper limit on reversal risk ratings but appeared to misunderstand the concept as proposed in the draft methodological tool. As proposed in the draft methodological tool, an upper limit on reversal risk ratings would serve to exclude Article 6.4 activities from eligibility if they feature a reversal risk rating above a specified threshold. In contrast, some comments suggested that an upper limit on reversal risk ratings could be employed to designate an Article 6.4 activity that the draft methodological tool calculates as having a reversal risk rating above a specified threshold as having a reversal risk rating at the lower threshold instead. The MEP took note of this suggestion but declined to implement it, as such an approach would not accurately account for reversal risks.
95. The MEP also noted comments in support of its proposal not to set an upper limit on reversal risk ratings in this version of the draft methodological tool and agreed to maintain its proposed approach (see section 3.7 of this cover note).

3.11. Summary of public comments not addressed in the recommendation by the MEP

96. Several comments suggested that the MEP make changes to the draft methodological tool that are inconsistent with the Reversals Standard, including:
- (a) Recommendations not to apply the draft methodological tool to Article 6.4 activities that reduce non-renewable biomass consumption. The MEP notes that this application is required by paragraph 6(a) of version 1.0 of the Reversals Standard. Pursuant to paragraph 22(a) of the SBM 022 meeting report (A6.4-SBM022), the Supervisory Body has requested additional information on this topic from the MEP, which is addressed in the “Information note: Analysis of matters raised by the Supervisory Body at its 22nd meeting on the “Draft mechanism methodology: Energy efficiency measures in household cooking”” (A6.4-MEP016-AXX) (hereinafter the “SBM 023 Information Note”);³³
 - (b) Arguments that activities reducing non-renewable biomass consumption do not have reversal risks. The MEP notes that the application of the draft methodological tool to these activities is required by paragraph 6(a) of version 1.0 of the Reversals Standard. Pursuant to paragraph 22(a) of the SBM 022 meeting report (A6.4-SBM022), the Supervisory Body has requested additional information on this topic from the MEP, which is addressed in the SBM 023 Information Note;
 - (c) Recommendations not to calculate a percentage of A6.4ER issuance to be contributed to the reversal risk buffer pool account. The MEP notes that section 6.5 of version 1.0 of the Reversals Standard requires the use of the reversal risk assessment tool to determine the percentage of A6.4ER issuance to be contributed to the reversal risk buffer pool account;
 - (d) Recommendations that the MEP rely on the fNRB Tool to address reversal risks. The MEP noted that it had clarified with the MoFuSS modelling team whether the default values included in the fNRB Tool considered non-permanence or reversal risks and had been informed that they do not; and
 - (e) Recommendations to change other aspects of the Removals Standard or Reversals Standard. Some comments raised considerations related to the definition of a “negligible risk of reversal”. Paragraph 3(g) of version 1.0 of the Reversals Standard defines this term by reference to a quantitative threshold to be determined in individual mechanism methodologies. The MEP took note of these comments, which are outside the scope of its work on the draft methodological tool because they relate to mechanism methodologies instead.
97. Several comments referenced the draft Concept Note on Paragraph 62, including to:
- (a) Request clarification about the relationship between this draft methodological tool and the draft Concept Note on Paragraph 62. The MEP notes that, pursuant to section 4.6.1 of version 1.0 of the Removals Standard, reversal risk assessment using the reversal risk assessment tool and contributions to the reversal risk buffer pool account are mandatory, and that, subject to paragraph 12 of version 1.0 of the Reversals Standard, mechanism methodologies shall require activity participants to apply the reversal risk assessment tool to greenhouse gas reservoirs involved in the issuance of A6.4ERs that are subject to reversal risks. Paragraph 62 of version 1.0 of the Removals Standard also references potential

³³ See <https://unfccc.int/sites/default/files/resource/A6.4-SBM022.pdf>.

reversal-risk management practices that could complement or replace the application of the draft methodological tool and reversal risk buffer pool account, but which are neither approved by the Supervisory Body nor in operation as of this writing. The draft Concept Note on Paragraph 62 provides commentary and technical information about some of these options for the Supervisory Body's consideration, along with a response to a specific mandate to recommend conditions and criteria for the use of third-party insurance or guarantee products in the post-crediting monitoring period;

- (b) Request changes to the draft Concept Note on Paragraph 62. These comments were out of scope for this methodological tool but were noted by the MEP in its work on that document;
 - (c) Request changes to the draft methodological tool to address topics related to paragraph 62 of version 1.0 of the Removals Standard. These comments are out of scope because the MEP is obligated to work within the requirements of the existing Removals Standard and Reversals Standard, rather than to implement new approaches not authorized by the Supervisory Body;
 - (d) Address considerations related to the sufficiency of the reversal risk buffer pool account in relation to reversal risks, including portfolio-wide considerations and "tail risks". The MEP noted that, pursuant to paragraphs 60 and 61 of version 1.0 of the Removals Standard, the Supervisory Body requires a stress test of the reversal risk buffer pool account but has neither developed a procedure for the stress test nor defined its intended level of confidence in the reversal risk buffer pool account. Accordingly, in the draft Concept Note on Paragraph 62, the MEP recommends that the Supervisory Body provide a mandate to the MEP to elaborate a procedure for the stress test, including to define the intended level of confidence in the reversal risk buffer pool account. The MEP took note of these comments, which it agrees would be relevant to address in more detail if the Supervisory Body provides the recommended mandate to develop a procedure for the reversal risk buffer pool account stress test; and
 - (e) Recommend that the MEP not elaborate the reversal risk assessment tool until the Supervisory Body identifies its intended level of confidence in the reversal risk buffer pool account. While the MEP agrees that this determination is important and may recommend that the Supervisory Body provide a mandate to the MEP to address this issue when it finalizes the Concept Note on Paragraph 62, the MEP is already mandated to implement the reversal risk assessment tool and would contradict this mandate if it were to delay implementation to consider a matter that is not already part of an existing Supervisory Body mandate.
98. Several comments discussed the relationship between the draft methodological tool's initial application to activities that reduce non-renewable biomass consumption and potential future applications, which include but are not limited to ongoing work on forestry, subsurface geologic storage, and biochar (see paragraph 21 of this cover note). These comments include:
- (a) Suggestions to expand the applicability of the draft methodological tool to other activity types beyond forestry, subsurface geologic storage, and biochar. The MEP took note of these comments and will consider them as it further elaborates the draft reversal risk assessment tool to address additional greenhouse gas reservoirs and activity types;

- (b) Suggestions concerning how the MEP should or should not conduct reversal risk assessment in applications to other activity types, for large-scale crediting programmes, or in future updates to the draft methodological tool's initial application. Although these comments are outside the scope of the draft methodological tool, the MEP observed that the reversal risk assessment tool is designed to be modular, such that approaches taken for one application may or may not be the same in other applications (see paragraph 18 of this cover note);
- (c) Suggestions to comprehensively analyse reversal risks across multiple activity types, with some comments suggesting that this analysis be conducted before the MEP recommends a draft methodological tool. The MEP took note of these comments and observed that the secretariat commissioned such an analysis from an external scientific consultant, which was one of the inputs considered by the MEP during the development of the Reversals Standard and draft methodological tool;
- (d) The MEP noted comments requesting the establishment of additional processes to provide input on the development of human-induced reversal risk factors, but noted that these requests are outside the MEP's mandate;
- (e) Concerns about potential flexibility for reversal monitoring, reporting, and remediation requirements under paragraphs 13 through 15 of version 1.0 of the Reversals Standard in the context of potential forestry, subsurface geologic storage, and biochar applications. The MEP took note of these concerns and clarified that the Reversals Standard allows mechanism methodologies to propose alternative provisions only where strict criteria are met. The MEP noted that these conditions are included in the Reversals Standard and that there is neither a recommendation from the MEP to change these conditions nor a mandate from the Supervisory Body to propose such changes. The MEP further noted that evaluating whether other activity types may qualify for these flexibility provisions is outside the scope of the draft methodological tool, and that the language referencing potential flexibility provisions is located only in the cover note (rather than in regulatory text) and is limited exclusively to draft mechanism methodologies for reducing non-renewable biomass consumption; and
- (f) Recommendations to maintain any initial reversal risk ratings for Article 6.4 activities, even if the draft methodological tool is updated in the future such that the application of the updated draft methodological tool would result in a different reversal risk rating. The MEP noted that this issue is already addressed in paragraphs 102 and 103 of version 1.0 of the "Procedure: Development, revision and clarification of methodologies and methodological tools" (A6.4-PROC-METH-001).³⁴ The MEP further noted that, at the renewal of the crediting period, paragraph 163(a) of version 3.0 of the "Standard: Article 6.4 activity standard for projects" (A6.4-STAN-AC-002) requires application of a valid version of the methodological tool at the time the renewal request is submitted, and paragraph 162(h) separately requires the reversal risk assessment to be updated as part of renewal. Accordingly, if default values provided in the methodological tool have been updated by the time of the next renewal of the crediting period, the updated default values would be applied at that time.³⁵

³⁴ See <https://unfccc.int/sites/default/files/resource/A6.4-PROC-METH-001.pdf>.

³⁵ See <https://unfccc.int/sites/default/files/resource/A6.4-STAN-AC-002.pdf>.

99. Several comments referenced the proposal in paragraph 57 of version 2.0 of the draft “Mechanism methodology: Energy efficiency measures in household cooking” (A6.4-MEP014-A04) to immediately cancel A6.4ERs transferred to the reversal risk buffer pool account.³⁶ The MEP took note of these comments but observed that they are outside the scope of the draft methodological tool.
100. Several comments referenced the use of baseline scenarios or matters related to the “Standard: Setting the baseline in mechanism methodologies” (A6.4-STAN-METH-003).³⁷ The MEP took note of these comments but observed that they are outside the scope of the draft methodological tool.

4. Impacts

101. This draft methodological tool will enable activity participants to:
- (a) Calculate the parameter $F_{buffer,i,t}$ which is used in mechanism methodologies to determine the number of A6.4ERs to be forwarded to the reversal risk buffer pool Account, consistent with equation (8) of version 1.0 of the Reversals Standard; and
 - (b) Determine whether the stored greenhouse gases (or precursors of greenhouse gases) for which A6.4ERs have been issued are at a negligible risk of reversal, as defined in their applicable mechanism methodology.
102. The MEP further notes that the draft methodological tool will support the issuance of A6.4ERs to Article 6.4 activities that reduce non-renewable biomass consumption (e.g., clean cooking activities), including those that have applied to transition from the Clean Development Mechanism to the Article 6.4 mechanism.

5. Subsequent work and timelines

103. The MEP will continue updating the draft methodological tool to include additional applications in the future. Without prejudice to any other potential applications, the MEP’s current efforts include applications for:
- (a) Forestry;
 - (b) Subsurface geologic storage; and
 - (c) Biochar.
104. The MEP notes that future applications may take different approaches from that proposed for activities reducing non-renewable biomass consumption. For example, as referenced above in paragraph 16 of this cover note, future applications may include alternatives to the use of default values for reversal risk factors, depending on the characteristics of the relevant greenhouse gas reservoirs and activity types.
105. The MEP notes that, consistent with its mandatory procedures, any additional updates will undergo separate calls for public input, such that interested stakeholders will be provided with an opportunity to comment on any future developments that are not included in the initial version of this draft methodological tool (e.g., to expand the eligibility of this draft methodological tool to different greenhouse gas reservoirs or activity types).

³⁶ See <https://unfccc.int/sites/default/files/resource/A6.4-MEP014-A04.pdf>.

³⁷ See <https://unfccc.int/sites/default/files/resource/A6.4-STAN-METH-004.pdf>.

6. Recommendations to the Supervisory Body

106. The MEP recommends that the Supervisory Body:
- (a) Consider the proposed range for the following parameters:
 - (i) Between 20 and 45 per cent for human-induced reversal risk factors (see paragraph 24 of the draft methodological tool and the discussion in section 3.5.3.1.1 of this cover note); and
 - (ii) Between 20 and 80 per cent for the sum of all human-induced reversal risk reduction factors (see Table 2 of the draft methodological tool and the discussion in section 3.5.3.1.3 of this cover note).
 - (b) Select default values for the parameters identified in paragraph 106(a), taking into account the analysis provided in section 3.5.4 of this cover note and noting that the sum referenced in paragraph 106(a)(ii) should be allocated across individual reversal risk reduction factors (see Table 2 of the draft methodological tool), according to the Supervisory Body's policy judgment; and
 - (c) Adopt the draft "Methodological tool: Reversal risk assessment".
107. The MEP also seeks a mandate from the Supervisory Body to revise the methodological tool with respect to activities that reduce non-renewable biomass consumption when credible new evidence indicates such an update would be warranted.

DRAFT

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1. Introduction

1.1. Scope

1. This methodological tool provides an approach for assessing reversal risk under the Article 6.4 mechanism. It applies to Article 6.4 projects and, in the case of programmes of activities (PoAs), to component projects (CPs) that are subject to reversal risks. Article 6.4 projects and PoAs are jointly referred to as Article 6.4 activities.
2. This methodological tool establishes requirements to determine the parameter in Table 1, which is used to determine the number of A6.4ERs to be forwarded to the reversal risk buffer pool account:¹

Table 1. Parameter determined

Parameter	SI Unit	Description
$F_{buffer,i,t}$	Dimensionless	The fraction of the net enhancement in storage of a greenhouse gas or a precursor in reservoir i , resulting from the Article 6.4 project or CP over the period of time covered by monitoring report t , as determined by this methodological tool, and used to determine the number of A6.4ERs to be forwarded to the reversal risk buffer pool account. ²

1.2. Entry into force and validity

3. This methodological tool enters into force on DD Month YYYY.
4. This methodological tool remains valid for five years, until DD Month YYYY, unless an earlier date applies if the methodological tool is revised or withdrawn in accordance with the “Procedure: Development, Revision and Clarification of Methodologies and Methodological Tools” (A6.4-PROC-METH-001).³

2. Definitions

5. The following general terms apply in this methodological tool:
 - (a) “Shall” is used to indicate requirements that must be followed;

¹ For context, the “Standard: Addressing non-permanence and reversals in mechanism methodologies” (A6.4-STAN-METH-007) (hereinafter referred to as the “Reversals Standard”) applies this parameter only to the net change in storage of a greenhouse gas (or a precursor to a greenhouse gas) in a greenhouse gas reservoir i , separate from the net change in emissions from sources other than the greenhouse gas reservoir i . Additional information is provided in section 6 of the Reversals Standard.

² This definition is consistent with equation (8) of version 1.0 of the Reversals Standard.

³ See <https://unfccc.int/sites/default/files/resource/A6.4-PROC-METH-001.pdf>.

- (b) “Should” is used to indicate that, among several options, one course of action is recommended as particularly suitable; and
 - (c) “May” is used to indicate what is permitted.
6. The following methodological terms and definitions apply in this methodological tool:
- (a) **Human-induced reversal risk:** Reversal risk arising from human-induced factors (e.g., as applicable, activity finance and management; asset ownership; rising opportunity costs; regulatory uncertainty and social instability; political, governance, and legal risks; acts of terrorism, crime and war);⁴
 - (b) **Natural reversal risk:** Reversal risk from natural disturbances and extreme events (e.g., as applicable, fires, pests, droughts, hurricanes, floods, landslides, earthquakes, volcanic eruptions, and geologic faults and fractures);⁵
 - (c) **Reversal risk:** The risk of reversal of greenhouse gases or their precursors stored in one or more applicable greenhouse gas reservoir(s);
 - (d) **Reversal risk factor:** The estimated loss of credited greenhouse gas stocks over a 100-year period that is attributable to an applicable reversal risk type in an applicable greenhouse gas reservoir;
 - (e) **Reversal risk mitigation measure:** An intervention undertaken or demonstrated by the Article 6.4 activity that reduces or eliminates a reversal risk factor;⁶
 - (f) **Reversal risk rating:** The reversal risk factor associated with a given greenhouse gas reservoir and reversal risk type(s), adjusted for any reversal risk reduction factor(s), as applicable;⁷
 - (g) **Reversal risk reduction factor:** A dimensionless parameter that reflects the reduction in reversal risk where an appropriate reversal risk mitigation measure is present; and
 - (h) **Reversal risk type:** A category or individual driver of reversal risks.⁸

⁴ This definition is intended to align with paragraphs 37(a) and 37(b) of version 1.0 of the “Standard: Requirements for activities involving removals under the Article 6.4 mechanism” (A6.4-STAN-METH-002) (the Removals Standard).

⁵ This definition is intended to align with paragraph 37(c) of version 1.0 of the Removals Standard.

⁶ For example, tree thinning practices can reduce the risk of wildfire; proper site selection and reservoir characterization practices for subsurface geologic carbon storage projects can reduce the risk of induced seismicity; and third-party financial guarantees can reduce the risk of insolvency.

⁷ In certain circumstances, the reversal risk factor may inherently account for appropriate reversal risk mitigation measures and therefore may not require an adjustment to the reversal risk factor to produce a reversal risk rating. For example, the site screening criteria for geologic storage of CO₂ under a regulatory framework are a form of reversal risk reduction for CO₂ leakage from natural seismic activity. If these effects are already incorporated into the reversal risk factor, no additional adjustments are needed.

⁸ For example, wildfire, induced seismicity, or insolvency.

7. Furthermore, the terms in “Glossary: Article 6.4 mechanism terms” (A6.4-GLOS-GOV-001) and the definitions and terms in the methodological tools referred to in section 3 shall apply.⁹

3. Normative and informative references

8. The following documents are indispensable for the application of this methodological tool. When applying this methodological tool, a valid version of the document listed below shall be used:
- (a) “Standard: Addressing non-permanence and reversals in mechanism methodologies” (A6.4-STAN-METH-007) (hereinafter referred to as the “Reversals Standard”).¹⁰
9. The following documents provide supporting information that may assist in the application of this methodological tool:
- (a) “Methodological tool: Fraction of non-renewable biomass” (A6.4-AMT-009) (hereinafter referred to as the “fNRB Tool”);¹¹ and
- (b) Wu, C. et al. (2026). Forest carbon protocols underestimate climate-driven carbon loss risks, *Nature* 654, 107–113.¹²

4. Applicability

4.1. General requirements

10. This methodological tool is applicable to Article 6.4 projects or CPs where its use is explicitly referenced in the applicable mechanism methodology.
11. This methodological tool is only applicable where the referring mechanism methodology specifies:
- (a) All applicable greenhouse gas reservoirs, consistent with the Reversals Standard; and
- (b) That this methodological tool shall be applied to each applicable greenhouse gas reservoir i to determine the parameter $F_{buffer,i,t}$.
12. This version of the methodological tool is applicable only to the following type of activities:¹³
- (a) Article 6.4 activities reducing non-renewable biomass consumption.
13. Mechanism methodologies applying this methodological tool shall use the approaches set out in this methodological tool and shall not introduce alternative approaches, except where this methodological tool expressly provides that specified elements may be defined

⁹ See <https://unfccc.int/sites/default/files/resource/A6.4-Glossary.pdf>.

¹⁰ See <https://unfccc.int/sites/default/files/resource/A6.4-STAN-METH-007.pdf>.

¹¹ See <https://unfccc.int/sites/default/files/resource/A6.4-AMT-009-v01.0.pdf>.

¹² See <https://doi.org/10.1038/s41586-026-10571-y>.

¹³ This methodological tool will be amended in the future to cover other types of Article 6.4 activities.

by the mechanism methodology and such definitions are consistent with this methodological tool.

14. This methodological tool includes additional applicability conditions specific to the activity type and greenhouse gas reservoirs of an Article 6.4 project or CP, as specified below.

4.2. Article 6.4 activities reducing non-renewable biomass consumption

15. In addition to the general requirements set out in section 4.1, this methodological tool is applicable to activities reducing non-renewable biomass consumption only where the referring mechanism methodology:

- (a) Identifies a source of non-renewable biomass as an applicable greenhouse gas reservoir (e.g., above-ground woody biomass);¹⁴
- (b) Identifies a geographic area or region, rather than a specific parcel or plantation, as the source of non-renewable biomass consumption that is reduced by an Article 6.4 project or CP;¹⁵ and
- (c) Specifies, for the purposes of applying the fNRB Tool to determine the fraction of non-renewable biomass, whether activity participants shall apply a sub-national, national, or multi-national default value for the fNRB Tool or the conditions for selecting among these alternatives, consistent with paragraph 10 of version 1.0 of the fNRB Tool.

5. Reversal risk assessment

5.1. Article 6.4 activities reducing non-renewable biomass consumption

16. The parameter $F_{buffer,i,t}$ shall be calculated as follows:

$$F_{buffer,i,t} = Rating_{natural,i} + Rating_{human,i,k} - Rating_{joint,i} \quad \text{Equation (1)}$$

Where:

$F_{buffer,i,t}$	=	The fraction of the net enhancement in storage of a greenhouse gas or a precursor in reservoir i , resulting from the Article 6.4 project or CP over the period covered by monitoring report t , as determined by this methodological tool and used to determine the number of A6.4ERs to be forwarded to the reversal risk buffer pool account
$Rating_{natural,i}$	=	The reversal risk rating for all natural reversal risks with respect to greenhouse gas reservoir i
$Rating_{human,i,k}$	=	The reversal risk rating for all human-induced reversal risks with respect to greenhouse gas reservoir i and host Party k
$Rating_{joint,i}$	=	The reversal risk rating for all reversal risks jointly caused by natural and human-induced reversal risks with respect to greenhouse gas reservoir i

¹⁴ This provision is intended to be consistent with paragraph 11 of version 1.0 of the Reversals Standard, which requires mechanism methodologies to identify relevant greenhouse gas reservoirs.

¹⁵ For activities reducing non-renewable biomass consumption, reduced loss of non-renewable biomass is expected to occur across the relevant geographic area or region, rather than be attributable to a specific parcel of land or plantation.

i	=	The greenhouse gas reservoir identified in paragraph 15(a)
k	=	The host Party of the Article 6.4 project or CP
t	=	The monitoring report for which this methodological tool is applied

17. The parameter $Rating_{joint,i}$ shall be set to 0 per cent as a default value.¹⁶
18. If the parameter $F_{buffer,i,t}$ as calculated using equation (1) is greater than 1, activity participants shall set the parameter equal to 1.

5.1.1. Natural reversal risks

19. Activity participants shall assess natural reversal risks for each Article 6.4 project or CP using the same geographic level selected when applying the fNRB Tool (i.e., subnational, national, or multi-national level) and subject to the following conditions:
 - (a) If default natural reversal risk factors are not available in this methodological tool for the selected subnational level, activity participants shall assess reversal risks using the national level; and
 - (b) If default natural reversal risk factors are not available in this methodological tool for the selected national level, activity participants shall assess reversal risks at either the subnational or multi-national level, following any applicable guidance in the mechanism methodology for selecting the geographic level of analysis in the fNRB Tool.
20. The reversal risk rating for all natural reversal risks ($Rating_{natural,i}$) shall be calculated as follows:

$$Rating_{natural,i} = R_{wildfire,i} + R_{other,i} \quad \text{Equation (2)}$$

Where:

$Rating_{natural,i}$	=	The reversal risk rating for all natural reversal risks with respect to greenhouse gas reservoir i
$R_{wildfire,i}$	=	The reversal risk factor for wildfire with respect to greenhouse gas reservoir i , as specified in paragraph 21
$R_{other,i}$	=	The reversal risk factor for all other natural reversal risks with respect to greenhouse gas reservoir i , as specified in paragraph 21
i	=	The greenhouse gas reservoir identified in paragraph 15(a)

21. To determine reversal risk factors for wildfire ($R_{wildfire,i}$) and all other natural reversal risks ($R_{other,i}$), activity participants shall use the default values provided in Appendix 1 for the multi-national (Table 1), national (Table 2), and sub-national (Table 3) levels, as

¹⁶ This determination is based on expert judgment.

applicable. These values account for the impacts of climate change on reversal risk factors.¹⁷

22. Reversal risk reduction factors for all natural reversal risks shall be deemed to be zero at the jurisdictional scale and are therefore not included in equation (2).¹⁸

5.1.2. Human-induced reversal risks

23. The reversal risk rating for all human-induced reversal risks ($Rating_{human,i,k}$) shall be calculated as follows:

$$Rating_{human,i,k} = R_{human,i} \times (1 - M_{human,k}) \quad \text{Equation (3)}$$

Where:

$Rating_{human,i}$	=	The reversal risk rating for all human-induced reversal risks with respect to greenhouse gas reservoir i and host Party k
$R_{human,i}$	=	The reversal risk factor for all human-induced reversal risks with respect to greenhouse gas reservoir i
$M_{human,k}$	=	The reversal risk reduction factor for human-induced reversal risk reduction actions for host Party k
i	=	The greenhouse gas reservoir identified in paragraph 15(a)
k	=	The host Party of the Article 6.4 project or CP

24. The parameter $R_{human,i}$ shall be set to [X] as a default value.

[Note: The MEP recommends that the value for X be set between 20 and 45 per cent, according to the judgement of the Supervisory Body]

25. The reversal risk reduction factor for human-induced reversal risks ($M_{human,k}$) shall be calculated as follows:

$$M_{human,k} = M_{NDC,k} + M_{LT-LEDS,k} + M_{REDD,k} \quad \text{Equation (4)}$$

Where:

$M_{human,k}$	=	The reversal risk reduction factor for human-induced reversal risk mitigation measures for host Party k
$M_{NDC,k}$	=	The reversal risk reduction factor for applicable NDC submissions for host Party k

¹⁷ These climate impacts are intended to reflect the direction in paragraph 37(d) of the Removals Standard. Reversal risk factors are calculated using the “absolute reversal” method from Wu et al. (2026), based on global data and methods as documented in Appendix 2 for the “tr55bt716” disturbance scenario under the “SSP2-4.5” climate scenario. This approach, which reflects the best available estimate of natural reversal risks, is appropriate for Article 6.4 activities that reduce non-renewable biomass consumption for which the A6.4ERs contributed to the reversal risk buffer pool account are to be immediately cancelled. In other contexts, different scenarios may be considered in future versions of this tool to ensure the sufficiency of the reversal risk buffer pool account.

¹⁸ No jurisdiction-wide efforts to implement reversal risk mitigation measures were identified at the subnational, national, or multi-national levels during the development of this methodological tool.

- $M_{LT-LEDS,k}$ = The reversal risk reduction factor for applicable LT-LEDS submissions for host Party k
- $M_{REDD,k}$ = The reversal risk reduction factor for applicable UNFCCC REDD-plus measures for host Party k
- k = The host Party of the Article 6.4 project or CP

26. The parameter $M_{NDC,k}$ shall be set to:

- (a) The default reversal risk reduction factor for human-induced reversal risks listed in Table 2 if the host Party of the Article 6.4 project or CP has:
- (i) A nationally determined contribution (NDC) that covers the land use, land-use change, and forestry (LULUCF) sector; and
 - (ii) Communicated a biennial transparency report (BTR) in which:
 - a. The national inventory report, as per the provisions in section II of the annex to decision 18/CMA.1, covers LULUCF emissions and removals and the common reporting tables (CRTs) covers all applicable tables for the LULUCF sector; and
 - b. The information necessary to track progress made in implementing and achieving the NDC, as per the provisions in section III of the annex to decision 18/CMA.1, includes information on the relevant indicators to track progress towards the implementation and achievement of the NDC with respect to emissions and removals from LULUCF; or
- (b) Zero in all other cases.

27. The parameter $M_{LT-LEDS,k}$ shall be set to:

- (a) The default reversal risk reduction factor for human-induced reversal risks in Table 2 if the host Party of the Article 6.4 project or CP has communicated a long-term low emissions development strategy (LT-LEDS) which includes the objective of halting and reversing deforestation and forest degradation and includes a defined timeframe for that objective in the LT-LEDS;
- (b) 50 per cent of the value Table 2 if the host Party of the Article 6.4 project or CP has communicated a LT-LEDS which includes the objective of halting and reversing deforestation and forest degradation, but does not include a defined timeframe for that objective in the LT-LEDS; or
- (c) Zero in all other cases.

28. The parameter $M_{REDD,k}$ shall be set to:

- (a) The default reversal risk reduction factor for human-induced reversal risks in Table 2 if the host Party of the Article 6.4 project or CP has implemented the following four elements referred to in paragraph 71 of decision 1/CP.16, as further operationalized through relevant decisions comprising the Warsaw Framework for Reducing Emissions from Deforestation and forest Degradation (REDD)-plus:
- (i) A national REDD-plus strategy or action plan (NS/AP);
 - (ii) A national forest monitoring system (NFMS);

- (iii) A forest reference emissions level or forest reference level (FREL/FRL); and
 - (iv) A safeguard information system (SIS);
- (b) A fraction of the default reversal risk reduction factor for human-induced reversal risks listed in Table 2 if the host Party of the Article 6.4 project or CP satisfies some, but not all, of the conditions listed in paragraph 28(a), as follows:
 - (i) 75 per cent of the default factor in Table 2 for three conditions;
 - (ii) 50 per cent of the default factor in Table 2 for two conditions; or
 - (iii) 25 per cent of the default factor in Table 2 for one condition; or
- (c) Zero in all other cases.

Table 2. Reversal risk reduction factors for human-induced reversal risks

Region	NDC submission	LT-LEDS submission	REDD-plus submission
All regions	[X] per cent	[Y] per cent	[Z] per cent

[Note: the MEP recommends that the sum of $X + Y + Z$ be set to a value between 20 per cent and 80 per cent, with the distribution of values across the three reversal risk mitigation actions (X, Y, and Z individually) left to the judgment of the Supervisory Body].

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Appendix 1. Default natural reversal risk factors for Article 6.4 activities reducing non-renewable biomass consumption

1. This appendix contains the default natural reversal risk factors used for the reversal risk assessment of Article 6.4 activities that reduce non-renewable biomass consumption, as specified in section 5 of this methodological tool.

Table 1. Natural reversal risk factors (multi-national)

Region	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Asia & Pacific	2.1	24.6
Latin America & Caribbean	7.1	24.9
Sub-Saharan Africa	0.2	12.3

Table 2. Natural reversal risk factors (national)

Country	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Chad	0.0	9.0
China	3.0	25.1
Colombia	3.2	25.7
Costa Rica	1.3	24.7
Côte d'Ivoire	0.0	12.9
Republic of the Congo	2.0	29.0
Democratic Republic of the Congo	0.7	27.3
Djibouti	N/A	N/A
Dominican Republic	4.4	12.9
Ecuador	2.1	24.7
Equatorial Guinea	0.2	30.0
Eritrea	N/A	N/A
Eswatini	0.2	7.2
Ethiopia	0.1	8.9
Gabon	0.4	32.8
Gambia	0.0	6.1
Georgia	1.5	14.6
Ghana	0.0	13.2
Guatemala	5.3	23.9
Guinea	0.0	10.3
Guinea-Bissau	0.0	9.2

Country	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Guyana	6.7	34.9
Haiti	0.8	11.9
Honduras	2.6	20.2
India	0.7	21.8
Indonesia	2.4	24.2
Iran (Islamic Republic of)	4.7	16.6
Iraq	N/A	N/A
Jamaica	0.7	20.9
Jordan	N/A	N/A
Kazakhstan	4.9	11.0
Kenya	0.1	7.3
Kyrgyzstan	4.6	6.4
Lao People's Democratic Republic	0.0	22.3
Liberia	0.3	29.6
Madagascar	0.6	10.5
Malawi	0.0	7.9
Malaysia	0.5	25.6
Mali	0.0	6.2
Mauritania	N/A	N/A
Mexico	3.6	13.3
Mongolia	15.8	3.9
Mozambique	0.1	7.9
Myanmar	0.3	26.5
Namibia	0.1	4.6
Nepal	2.0	21.0
Nicaragua	1.6	22.5
Niger	0.0	7.7
Nigeria	0.0	12.8
Pakistan	3.1	5.8
Panama	5.1	27.8
Papua New Guinea	2.5	19.4
Peru	2.9	33.0
Philippines	0.4	25.4
Rwanda	0.0	11.4
Senegal	0.0	5.5
Sierra Leone	0.0	13.7
Somalia	0.0	3.8
South Africa	0.8	5.1
South Sudan	0.0	6.7
Sri Lanka	0.3	30.2

Country	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Sudan	0.0	5.2
Syrian Arab Republic	17.2	23.4
Tajikistan	12.1	8.8
Thailand	0.2	26.9
Timor-Leste	1.8	35.4
Togo	0.1	10.7
Türkiye	3.1	25.6
Turkmenistan	N/A	N/A
Uganda	0.0	9.8
United Republic of Tanzania	0.0	8.7
Uzbekistan	13.0	10.3
Viet Nam	0.3	28.0
Zambia	0.1	8.7
Zimbabwe	0.0	4.8

Table 3. Natural reversal risk factors (sub-national)

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Afghanistan	Badakhshan	N/A	N/A
Afghanistan	Badghis	N/A	N/A
Afghanistan	Baghlan	N/A	N/A
Afghanistan	Balkh	N/A	N/A
Afghanistan	Bamyan	N/A	N/A
Afghanistan	Daykundi	N/A	N/A
Afghanistan	Farah	N/A	N/A
Afghanistan	Faryab	N/A	N/A
Afghanistan	Ghazni	N/A	N/A
Afghanistan	Ghor	N/A	N/A
Afghanistan	Hilmand	N/A	N/A
Afghanistan	Hirat	N/A	N/A
Afghanistan	Jawzjan	N/A	N/A
Afghanistan	Kabul	N/A	N/A
Afghanistan	Kandahar	N/A	N/A
Afghanistan	Kapisa	N/A	N/A
Afghanistan	Khost	5.3	0.8
Afghanistan	Kunar	8.4	1.7
Afghanistan	Kunduz	N/A	N/A
Afghanistan	Laghman	N/A	N/A

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Afghanistan	Logar	N/A	N/A
Afghanistan	Nangarhar	11.1	0.8
Afghanistan	Nimroz	N/A	N/A
Afghanistan	Nuristan	8.9	1.6
Afghanistan	Paktika	N/A	N/A
Afghanistan	Paktya	5.0	1.0
Afghanistan	Panjshir	N/A	N/A
Afghanistan	Parwan	N/A	N/A
Afghanistan	Samangan	N/A	N/A
Afghanistan	Sari Pul	N/A	N/A
Afghanistan	Takhar	N/A	N/A
Afghanistan	Uruzgan	N/A	N/A
Afghanistan	Wardak	N/A	N/A
Afghanistan	Zabul	N/A	N/A
Angola	Bengo	0.2	15.3
Angola	Benguela	0.0	9.1
Angola	Bié	0.0	10.6
Angola	Cabinda	0.1	32.9
Angola	Cuando Cubango	0.1	6.7
Angola	Cuanza Norte	0.1	17.1
Angola	Cuanza Sul	0.0	10.3
Angola	Cunene	0.0	5.0
Angola	Huambo	0.0	9.5
Angola	Huíla	0.0	7.6
Angola	Luanda	0.1	7.7
Angola	Lunda Norte	0.0	15.7
Angola	Lunda Sul	0.1	11.9
Angola	Malanje	0.0	12.7
Angola	Moxico	0.3	9.8
Angola	Namibe	0.0	8.0
Angola	Uíge	0.1	18.0
Angola	Zaire	0.3	11.0
Armenia	Aragatsotn	2.3	14.3
Armenia	Ararat	2.3	20.0
Armenia	Armavir	N/A	N/A
Armenia	Yerevan	N/A	N/A
Armenia	Gegharkunik	3.5	13.7
Armenia	Kotayk	2.2	12.8
Armenia	Lori	2.0	11.8

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Armenia	Shirak	N/A	N/A
Armenia	Syunik	N/A	N/A
Armenia	Tavush	2.3	16.8
Armenia	Vayots Dzor	0.5	9.2
Azerbaijan	Absheron	2.2	17.5
Azerbaijan	Aran	2.9	27.7
Azerbaijan	Daglig-Shirvan	2.2	17.8
Azerbaijan	Ganja-Qazakh	3.6	15.4
Azerbaijan	Kalbajar-Lachin	N/A	N/A
Azerbaijan	Lankaran	2.5	13.5
Azerbaijan	Nakhchivan	N/A	N/A
Azerbaijan	Quba-Khachmaz	3.9	19.3
Azerbaijan	Shaki-Zaqatala	4.0	15.9
Azerbaijan	Yukhari-Karabakh	N/A	N/A
Bangladesh	Barisal	3.5	24.5
Bangladesh	Chittagong	0.4	36.4
Bangladesh	Dhaka	1.4	13.9
Bangladesh	Khulna	1.8	16.0
Bangladesh	Mymensingh	0.4	12.9
Bangladesh	Rajshahi	N/A	N/A
Bangladesh	Rangpur	0.5	19.0
Bangladesh	Sylhet	0.3	15.7
Benin	Alibori	0.0	8.9
Benin	Atakora	0.0	7.2
Benin	Atlantique	0.1	10.8
Benin	Borgou	0.0	10.0
Benin	Collines	0.0	11.2
Benin	Donga	0.0	10.2
Benin	Kouffo	0.0	10.5
Benin	Littoral	N/A	N/A
Benin	Mono	0.9	11.5
Benin	Ouémé	0.0	9.4
Benin	Plateau	0.0	11.0
Benin	Zou	0.0	11.1
Bhutan	Bumthang	2.6	9.7
Bhutan	Chhukha	1.8	10.4
Bhutan	Dagana	1.5	7.1
Bhutan	Gasa	1.6	5.7
Bhutan	Haa	1.7	11.8

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Bhutan	Lhuentse	1.6	8.3
Bhutan	Monggar	0.9	13.7
Bhutan	Paro	3.3	13.0
Bhutan	Pema Gatshel	0.4	9.6
Bhutan	Punakha	2.9	10.6
Bhutan	Samdrup Jongkhar	0.6	11.2
Bhutan	Samtse	1.1	10.2
Bhutan	Sarpang	0.5	7.8
Bhutan	Thimphu	3.3	11.0
Bhutan	Trashigang	0.9	15.6
Bhutan	Trongsa	2.5	13.5
Bhutan	Tsirang	1.6	16.5
Bhutan	Wangdue Phodrang	3.0	12.1
Bhutan	Zhemgang	0.7	10.3
Bolivia (Plurinational State of)	Beni	10.5	22.9
Bolivia (Plurinational State of)	Chuquisaca	4.6	14.2
Bolivia (Plurinational State of)	Cochabamba	4.7	28.8
Bolivia (Plurinational State of)	La Paz	15.0	24.0
Bolivia (Plurinational State of)	Oruro	N/A	N/A
Bolivia (Plurinational State of)	Pando	8.0	37.9
Bolivia (Plurinational State of)	Potosí	1.4	2.3
Bolivia (Plurinational State of)	Santa Cruz	1.3	1.5
Bolivia (Plurinational State of)	Tarija	4.8	14.0
Botswana	Central	0.0	2.6
Botswana	Chobe	0.0	3.1
Botswana	Francistown	0.1	4.1
Botswana	Gaborone	0.1	2.4
Botswana	Ghanzi	N/A	N/A
Botswana	Jwaneng	N/A	N/A
Botswana	Kgalagadi	N/A	N/A
Botswana	Kgatleng	0.2	3.9
Botswana	Kweneng	0.2	5.3
Botswana	Lobatse	N/A	N/A
Botswana	North-East	0.1	2.3
Botswana	North-West	0.1	3.1
Botswana	Selibe Phikwe	N/A	N/A
Botswana	South-East	0.1	3.0
Botswana	Southern	N/A	N/A

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Botswana	Sowa	N/A	N/A
Brazil	Acre	1.8	41.1
Brazil	Alagoas	0.6	9.6
Brazil	Amapá	6.2	37.2
Brazil	Amazonas	9.6	32.1
Brazil	Bahia	2.8	8.6
Brazil	Ceará	0.8	9.3
Brazil	Distrito Federal	0.4	9.5
Brazil	Espírito Santo	1.1	12.2
Brazil	Goiás	1.0	14.1
Brazil	Maranhão	4.0	22.3
Brazil	Mato Grosso	12.1	24.5
Brazil	Mato Grosso do Sul	1.9	10.6
Brazil	Minas Gerais	1.3	10.7
Brazil	Pará	11.3	32.4
Brazil	Paraíba	0.6	7.1
Brazil	Paraná	1.5	17.8
Brazil	Pernambuco	0.6	8.7
Brazil	Piauí	4.3	9.8
Brazil	Rio de Janeiro	2.4	14.2
Brazil	Rio Grande do Norte	0.3	6.7
Brazil	Rio Grande do Sul	0.9	13.3
Brazil	Rondônia	7.0	37.9
Brazil	Roraima	16.4	23.7
Brazil	Santa Catarina	1.5	21.7
Brazil	São Paulo	1.8	20.1
Brazil	Sergipe	0.4	9.0
Brazil	Tocantins	1.8	14.1
Burkina Faso	Boucle du Mouhoun	0.0	10.4
Burkina Faso	Cascades	0.0	9.9
Burkina Faso	Centre	N/A	N/A
Burkina Faso	Centre-Est	0.0	9.3
Burkina Faso	Centre-Nord	N/A	N/A
Burkina Faso	Centre-Ouest	0.0	9.9
Burkina Faso	Centre-Sud	0.0	9.7
Burkina Faso	Est	0.0	2.9
Burkina Faso	Haut-Bassins	0.0	10.1
Burkina Faso	Nord	N/A	N/A
Burkina Faso	Plateau-Central	N/A	N/A

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Burkina Faso	Sahel	N/A	N/A
Burkina Faso	Sud-Ouest	0.0	10.4
Burundi	Bubanza	0.0	10.2
Burundi	Bujumbura Mairie	0.1	12.1
Burundi	Bujumbura Rural	0.0	11.0
Burundi	Bururi	0.0	10.2
Burundi	Cankuzo	0.0	8.9
Burundi	Cibitoke	0.1	16.7
Burundi	Gitega	0.0	10.0
Burundi	Karuzi	0.0	11.1
Burundi	Kayanza	0.0	11.1
Burundi	Kirundo	0.0	10.3
Burundi	Makamba	0.0	10.6
Burundi	Muramvya	0.0	11.2
Burundi	Muyinga	0.0	9.9
Burundi	Mwaro	0.0	11.2
Burundi	Ngozi	0.0	10.3
Burundi	Rutana	0.0	10.2
Burundi	Ruyigi	0.0	10.5
Cambodia	Bântéay Méanchey	0.1	17.5
Cambodia	Batdâmbâng	0.6	18.8
Cambodia	Kâmpóng Cham	0.3	17.3
Cambodia	Kâmpóng Chhnang	0.1	16.6
Cambodia	Kâmpóng Spœ	0.1	23.8
Cambodia	Kâmpóng Thum	0.8	14.8
Cambodia	Kâmpôt	0.3	19.1
Cambodia	Kândal	0.3	13.2
Cambodia	Kaôh Kong	0.4	24.2
Cambodia	Kep	N/A	N/A
Cambodia	Krâchéh	0.3	34.6
Cambodia	Krong Pailin	0.1	28.7
Cambodia	Krong Preah Sihanouk	0.3	22.0
Cambodia	Môndól Kiri	0.2	37.5
Cambodia	Otdar Mean Chey	0.1	30.4
Cambodia	Phnom Penh	0.2	13.8
Cambodia	Pouthisat	0.1	22.5
Cambodia	Preah Vihéar	0.9	33.0
Cambodia	Prey Vêng	0.5	13.5
Cambodia	Rôtânôkiri	0.1	30.5

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Cambodia	Siemréab	3.6	22.9
Cambodia	Stœng Trêng	0.1	26.0
Cambodia	Svay Rieng	0.4	15.1
Cambodia	Takêv	0.2	13.7
Cambodia	Tbong Khmum	0.2	30.1
Cameroon	Adamaoua	0.0	14.3
Cameroon	Centre	N/A	N/A
Cameroon	Est	0.0	2.9
Cameroon	Extrême-Nord	0.2	8.8
Cameroon	Littoral	N/A	N/A
Cameroon	Nord	N/A	N/A
Cameroon	Nord-Ouest	0.1	16.7
Cameroon	Ouest	0.0	18.2
Cameroon	Sud	0.1	32.2
Cameroon	Sud-Ouest	0.0	10.4
Central African Republic	Bamingui-Bangoran	0.1	7.1
Central African Republic	Bangui	3.4	23.7
Central African Republic	Basse-Kotto	1.6	19.1
Central African Republic	Haut-Mbomou	0.2	15.3
Central African Republic	Haute-Kotto	0.1	11.8
Central African Republic	Kémo	0.6	9.4
Central African Republic	Lobaye	2.1	30.0
Central African Republic	Mambéré-Kadéï	0.4	24.8
Central African Republic	Mbomou	1.0	25.3
Central African Republic	Nana-Grébizi	0.3	10.8
Central African Republic	Nana-Mambéré	0.0	13.9
Central African Republic	Ombella-M'Poko	0.8	14.6
Central African Republic	Ouaka	0.2	10.9
Central African Republic	Ouham	0.1	10.8
Central African Republic	Ouham-Pendé	0.0	11.5
Central African Republic	Sangha-Mbaéré	1.7	34.8
Central African Republic	Vakaga	0.0	4.7
Chad	Barh el Ghazel	N/A	N/A
Chad	Batha	N/A	N/A
Chad	Borkou	N/A	N/A
Chad	Chari-Baguirmi	0.0	9.7
Chad	Ennedi Est	N/A	N/A
Chad	Ennedi Ouest	N/A	N/A
Chad	Guéra	0.0	8.6

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Chad	Hadjer-Lamis	0.0	12.5
Chad	Kanem	N/A	N/A
Chad	Lac	0.1	3.1
Chad	Logone Occidental	0.0	10.1
Chad	Logone Oriental	0.0	10.6
Chad	Mandoul	0.0	10.4
Chad	Mayo-Kebbi Est	0.0	6.8
Chad	Mayo-Kebbi Ouest	0.0	8.3
Chad	Moyen-Chari	0.0	9.2
Chad	Ouaddaï	N/A	N/A
Chad	Salamat	0.0	6.9
Chad	Sila	0.0	8.5
Chad	Tandjilé	0.0	8.8
Chad	Tibesti	N/A	N/A
Chad	Ville de N'Djamena	N/A	N/A
Chad	Wadi Fira	N/A	N/A
China	Anhui	1.2	32.2
China	Beijing	4.8	24.3
China	Chongqing	1.5	26.6
China	Fujian	1.2	30.1
China	Gansu	3.2	20.6
China	Guangdong	0.9	31.8
China	Guangxi	0.9	35.4
China	Guizhou	2.4	34.7
China	Hainan	0.0	33.1
China	Hebei	5.6	18.7
China	Heilongjiang	3.2	11.9
China	Henan	4.1	31.1
China	Hong Kong	N/A	N/A
China	Hubei	1.3	32.8
China	Hunan	1.3	34.8
China	Jiangsu	0.9	22.4
China	Jiangxi	1.8	32.3
China	Jilin	1.8	12.6
China	Liaoning	0.6	10.0
China	Macau	N/A	N/A
China	Nei Mongol	6.6	11.4
China	Ningxia Hui	5.3	10.9
China	Qinghai	1.9	5.8

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
China	Shaanxi	2.3	26.6
China	Shandong	8.6	27.6
China	Shanghai	0.7	15.4
China	Shanxi	12.5	19.5
China	Sichuan	5.5	20.9
China	Tianjin	N/A	N/A
China	Xinjiang Uygur	6.6	7.1
China	Xizang	4.0	15.7
China	Yunnan	4.0	30.8
China	Zhejiang	2.0	33.8
Colombia	Amazonas	9.6	32.1
Colombia	Antioquia	2.3	24.1
Colombia	Arauca	1.5	15.9
Colombia	Atlántico	0.6	20.7
Colombia	Bogotá	2.2	14.4
Colombia	Bolívar	2.3	25.0
Colombia	Boyacá	2.5	17.2
Colombia	Caldas	1.7	19.4
Colombia	Caquetá	3.0	28.3
Colombia	Casanare	1.2	11.5
Colombia	Cauca	2.5	25.3
Colombia	Cesar	3.9	17.5
Colombia	Chocó	3.9	31.0
Colombia	Córdoba	1.1	23.2
Colombia	Cundinamarca	1.8	19.1
Colombia	Guaina	7.6	29.2
Colombia	Guaviare	3.1	31.8
Colombia	Huila	2.3	24.5
Colombia	La Guajira	2.7	21.2
Colombia	Magdalena	1.3	20.1
Colombia	Meta	1.9	23.7
Colombia	Nariño	2.7	25.1
Colombia	Norte de Santander	3.8	24.2
Colombia	Putumayo	2.5	32.9
Colombia	Quindío	0.8	28.0
Colombia	Risaralda	1.1	25.4
Colombia	San Andrés	N/A	N/A
Colombia	Santander	1.9	20.0
Colombia	Sucre	1.3	19.6

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Colombia	Tolima	1.6	21.4
Colombia	Valle del Cauca	1.0	22.8
Colombia	Vaupés	3.4	25.4
Colombia	Vichada	5.8	24.6
Congo	Bouenza	0.1	14.3
Congo	Brazzaville	0.1	10.9
Congo	Cuvette	3.4	32.3
Congo	Cuvette-Ouest	2.0	33.8
Congo	Kouilou	0.2	39.2
Congo	Lékoumou	0.3	37.0
Congo	Likouala	4.3	34.4
Congo	Niari	0.2	28.2
Congo	Plateaux	0.9	17.3
Congo	Pointe Noire	N/A	N/A
Congo	Pool	0.2	12.2
Congo	Sangha	2.3	35.3
Costa Rica	Alajuela	0.9	19.1
Costa Rica	Cartago	1.0	31.5
Costa Rica	Guanacaste	0.9	21.4
Costa Rica	Heredia	1.4	27.1
Costa Rica	Limón	2.1	32.8
Costa Rica	Puntarenas	1.8	23.3
Costa Rica	San José	1.1	25.6
Côte d'Ivoire	Abidjan	N/A	N/A
Côte d'Ivoire	Bas-Sassandra	0.1	17.3
Côte d'Ivoire	Comoé	0.0	16.7
Côte d'Ivoire	Denguélé	0.0	9.9
Côte d'Ivoire	Gôh-Djiboua	0.0	10.9
Côte d'Ivoire	Lacs	0.0	10.8
Côte d'Ivoire	Lagunes	0.0	14.2
Côte d'Ivoire	Montagnes	0.1	22.4
Côte d'Ivoire	Sassandra-Marahoué	0.0	11.9
Côte d'Ivoire	Savanes	0.0	9.9
Côte d'Ivoire	Vallée du Bandama	0.0	10.3
Côte d'Ivoire	Woroba	0.0	11.0
Côte d'Ivoire	Yamoussoukro	0.0	10.0
Côte d'Ivoire	Zanzan	0.0	11.9
Democratic Republic of the Congo	Bas-Uele	1.0	33.3

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Democratic Republic of the Congo	Équateur	1.9	39.7
Democratic Republic of the Congo	Haut-Katanga	0.0	12.2
Democratic Republic of the Congo	Haut-Lomami	0.0	15.4
Democratic Republic of the Congo	Haut-Uele	0.0	27.8
Democratic Republic of the Congo	Ituri	0.0	28.7
Democratic Republic of the Congo	Kasaï	0.6	31.6
Democratic Republic of the Congo	Kasaï-Central	0.1	25.1
Democratic Republic of the Congo	Kasaï-Oriental	0.0	11.0
Democratic Republic of the Congo	Kinshasa	0.1	9.8
Democratic Republic of the Congo	Kongo-Central	0.1	14.2
Democratic Republic of the Congo	Kwango	0.2	17.8
Democratic Republic of the Congo	Kwilu	0.3	16.9
Democratic Republic of the Congo	Lomami	0.0	12.5
Democratic Republic of the Congo	Lualaba	0.0	13.8
Democratic Republic of the Congo	Mai-Ndombe	1.9	33.5
Democratic Republic of the Congo	Maniema	0.4	31.6
Democratic Republic of the Congo	Mongala	3.1	37.0
Democratic Republic of the Congo	Nord-Kivu	0.0	28.5
Democratic Republic of the Congo	Nord-Ubangi	2.3	30.8
Democratic Republic of the Congo	Sankuru	0.6	36.0
Democratic Republic of the Congo	Sud-Kivu	0.0	29.5
Democratic Republic of the Congo	Sud-Ubangi	2.7	31.5

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Democratic Republic of the Congo	Tanganyika	0.0	18.0
Democratic Republic of the Congo	Tshopo	0.8	36.7
Democratic Republic of the Congo	Tshuapa	0.7	38.2
Djibouti	Ali Sabieh	N/A	N/A
Djibouti	Arta	N/A	N/A
Djibouti	Dikhil	N/A	N/A
Djibouti	Djibouti	N/A	N/A
Djibouti	Obock	N/A	N/A
Djibouti	Tadjoura	N/A	N/A
Dominican Republic	Azua	5.9	7.0
Dominican Republic	Bahoruco	6.0	7.7
Dominican Republic	Barahona	7.3	7.8
Dominican Republic	Dajabón	2.5	15.7
Dominican Republic	Distrito Nacional	N/A	N/A
Dominican Republic	Duarte	0.9	21.6
Dominican Republic	El Seibo	0.1	11.5
Dominican Republic	Española	1.5	13.3
Dominican Republic	Hato Mayor	0.4	29.9
Dominican Republic	Independencia	4.7	8.2
Dominican Republic	La Altagracia	N/A	N/A
Dominican Republic	La Estrella	2.3	10.1
Dominican Republic	La Romana	N/A	N/A
Dominican Republic	La Vega	8.6	14.5
Dominican Republic	María Trinidad Sánchez	0.7	16.1
Dominican Republic	Monseñor Nouel	5.8	21.1
Dominican Republic	Monte Cristi	1.6	11.3
Dominican Republic	Monte Plata	0.4	18.2
Dominican Republic	Pedernales	7.3	8.7
Dominican Republic	Peravia	2.9	18.6
Dominican Republic	Puerto Plata	1.3	10.1
Dominican Republic	Salcedo	1.7	14.4
Dominican Republic	Samaná	0.5	22.2
Dominican Republic	San Cristóbal	1.2	18.2
Dominican Republic	San José de Ocoa	4.1	11.2
Dominican Republic	San Juan	N/A	N/A
Dominican Republic	San Pedro de Macorís	0.2	15.8

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Dominican Republic	Sánchez Ramírez	0.7	15.0
Dominican Republic	Santiago	7.9	10.8
Dominican Republic	Santiago Rodríguez	8.5	15.6
Dominican Republic	Santo Domingo	0.4	11.1
Dominican Republic	Valverde	2.6	10.8
Ecuador	Azuay	1.9	12.0
Ecuador	Bolívar	1.2	17.8
Ecuador	Cañar	1.3	13.0
Ecuador	Carchi	1.6	21.9
Ecuador	Chimborazo	0.7	9.2
Ecuador	Cotopaxi	0.9	19.7
Ecuador	El Oro	2.1	13.4
Ecuador	Esmeraldas	0.5	28.5
Ecuador	Galápagos	N/A	N/A
Ecuador	Guayas	0.8	14.1
Ecuador	Imbabura	1.4	22.4
Ecuador	Loja	3.7	17.0
Ecuador	Los Ríos	0.7	15.5
Ecuador	Manabí	0.5	13.4
Ecuador	Morona Santiago	3.0	30.6
Ecuador	Napo	3.1	26.5
Ecuador	Orellana	2.3	30.4
Ecuador	Pastaza	2.1	26.2
Ecuador	Pichincha	1.0	18.9
Ecuador	Santa Elena	1.1	12.2
Ecuador	Santo Domingo de los Tsachilas	0.5	18.1
Ecuador	Sucumbios	3.0	33.3
Ecuador	Tungurahua	1.9	14.2
Ecuador	Zamora Chinchipe	6.3	37.3
Equatorial Guinea	Annobón	N/A	N/A
Equatorial Guinea	Bioko Norte	N/A	N/A
Equatorial Guinea	Bioko Sur	N/A	N/A
Equatorial Guinea	Centro Sur	0.2	30.1
Equatorial Guinea	Kié-Ntem	0.1	26.2
Equatorial Guinea	Litoral	0.2	29.4
Equatorial Guinea	Wele-Nzas	0.1	32.5
Eritrea	Anseba	N/A	N/A
Eritrea	Debub	N/A	N/A

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Eritrea	Debubawi Keyih Bahri	N/A	N/A
Eritrea	Gash Barka	N/A	N/A
Eritrea	Maekel	N/A	N/A
Eritrea	Semenawi Keyih Bahri	N/A	N/A
Eswatini	Hhohho	0.1	7.3
Eswatini	Lubombo	0.3	5.5
Eswatini	Manzini	0.1	9.0
Eswatini	Shiselweni	0.2	8.1
Ethiopia	Afar	0.1	3.4
Ethiopia	Amhara	0.0	7.0
Ethiopia	Benshangul-Gumaz	0.0	7.6
Ethiopia	Dire Dawa	0.2	3.1
Ethiopia	Gambela Peoples'	0.1	12.2
Ethiopia	Harari Peoples'	0.7	5.9
Ethiopia	Oromia	0.1	8.9
Ethiopia	Somali	0.3	5.2
Ethiopia	Southern Nations, Nationalities, and Peoples'	0.0	9.7
Ethiopia	Tigray	0.2	7.0
Ethiopia	Addis Ababa	0.0	3.2
Gabon	Haut-Ogooué	0.5	31.1
Gabon	Moyen-Ogooué	0.5	32.4
Gabon	Ngounié	0.4	30.4
Gabon	Nyanga	0.5	29.5
Gabon	Ogooué-Ivindo	0.2	33.2
Gabon	Ogooué-Lolo	0.6	36.8
Gabon	Ogooué-Maritime	0.5	31.0
Gabon	Wouleu-Ntem	0.1	34.8
Georgia	Abkhazia	1.2	13.0
Georgia	Ajaria	0.3	9.2
Georgia	Guria	0.4	10.4
Georgia	Imereti	0.3	9.6
Georgia	Kakheti	2.3	17.4
Georgia	Kvemo Kartli	1.8	12.5
Georgia	Mtskheta-Mtianeti	3.2	20.1
Georgia	Racha-Lechkhumi-Kvemo Svaneti	1.6	15.6
Georgia	Samegrelo-Zemo Svaneti	1.2	13.3

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Georgia	Samtskhe-Javakheti	1.2	11.7
Georgia	Shida Kartli	0.7	17.0
Georgia	Tbilisi	1.6	12.5
Ghana	Ahafo	0.0	16.2
Ghana	Ashanti	0.0	14.7
Ghana	Bono	0.0	12.9
Ghana	Bono East	0.0	11.5
Ghana	Central	0.0	2.6
Ghana	Eastern	N/A	N/A
Ghana	Greater Accra	0.1	8.3
Ghana	North East	0.0	6.8
Ghana	Northern	N/A	N/A
Ghana	Oti	0.0	14.2
Ghana	Savannah	0.0	10.2
Ghana	Upper East	0.0	7.1
Ghana	Upper West	0.0	9.7
Ghana	Volta	0.2	11.1
Ghana	Western	N/A	N/A
Ghana	Western North	0.0	21.1
Gambia	Banjul	0.1	3.1
Gambia	Lower River	0.0	5.2
Gambia	Maccarthy Island	0.0	7.1
Gambia	North Bank	0.0	3.8
Gambia	Upper River	0.0	7.1
Gambia	Western	N/A	N/A
Guatemala	Alta Verapaz	5.3	24.5
Guatemala	Baja Verapaz	3.1	13.8
Guatemala	Chimaltenango	3.4	19.4
Guatemala	Chiquimula	2.0	12.5
Guatemala	El Progreso	1.6	7.2
Guatemala	Escuintla	2.7	11.3
Guatemala	Guatemala	0.7	3.1
Guatemala	Huehuetenango	5.4	24.1
Guatemala	Izabal	5.2	27.6
Guatemala	Jalapa	1.2	6.0
Guatemala	Jutiapa	1.6	10.4
Guatemala	Petén	6.8	29.2
Guatemala	Quezaltenango	2.1	19.0
Guatemala	Quiché	4.8	19.0

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Guatemala	Retalhuleu	4.5	12.7
Guatemala	Sacatepéquez	N/A	N/A
Guatemala	San Marcos	1.9	21.0
Guatemala	Santa Rosa	N/A	N/A
Guatemala	Sololá	3.7	22.5
Guatemala	Suchitepéquez	2.4	11.4
Guatemala	Totonicapán	2.6	16.5
Guatemala	Zacapa	2.7	13.9
Guinea	Boké	0.0	7.9
Guinea	Conakry	0.2	9.5
Guinea	Faranah	0.0	9.5
Guinea	Kankan	0.0	8.7
Guinea	Kindia	0.0	9.0
Guinea	Labé	0.0	7.2
Guinea	Mamou	0.0	8.9
Guinea	Nzérékoré	0.1	18.5
Guinea-Bissau	Bafatá	0.0	10.5
Guinea-Bissau	Biombo	0.0	9.6
Guinea-Bissau	Bissau	0.0	7.7
Guinea-Bissau	Bolama	N/A	N/A
Guinea-Bissau	Cacheu	0.0	8.3
Guinea-Bissau	Gabú	0.0	8.5
Guinea-Bissau	Oio	0.0	9.0
Guinea-Bissau	Quinara	0.0	10.5
Guinea-Bissau	Tombali	0.0	8.1
Guyana	Barima-Waini	2.3	39.3
Guyana	Cuyuni-Mazaruni	3.9	35.3
Guyana	Demerara-Mahaica	7.1	25.6
Guyana	East Berbice-Corentyne	8.9	35.3
Guyana	Essequibo Islands-West Demerara	6.7	41.5
Guyana	Mahaica-Berbice	12.8	24.4
Guyana	Pomeroon-Supenaam	2.7	39.9
Guyana	Potaro-Siparuni	5.2	34.1
Guyana	Upper Demerara-Berbice	11.4	34.4
Guyana	Upper Takutu-Upper Essequibo	7.9	33.9
Haiti	Centre	N/A	N/A
Haiti	Grand'Anse	N/A	N/A

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Haiti	L'Artibonite	0.4	12.6
Haiti	Nippes	N/A	N/A
Haiti	Nord	N/A	N/A
Haiti	Nord-Est	0.3	11.8
Haiti	Nord-Ouest	0.1	16.7
Haiti	Ouest	0.0	18.2
Haiti	Sud	0.1	32.2
Haiti	Sud-Est	5.2	8.1
Honduras	Atlántida	4.7	27.2
Honduras	Choluteca	1.0	12.7
Honduras	Colón	4.8	35.0
Honduras	Comayagua	1.8	11.3
Honduras	Copán	1.8	11.9
Honduras	Cortés	4.1	20.3
Honduras	El Paraíso	0.9	13.5
Honduras	Francisco Morazán	1.2	8.8
Honduras	Gracias a Dios	3.4	37.8
Honduras	Intibucá	2.4	12.4
Honduras	Islas de la Bahía	N/A	N/A
Honduras	La Paz	15.0	24.0
Honduras	Lempira	2.1	13.2
Honduras	Ocotepeque	1.5	12.4
Honduras	Olancho	2.5	24.4
Honduras	Santa Bárbara	3.2	16.9
Honduras	Valle	1.1	11.8
Honduras	Yoro	3.3	15.9
India	Andaman and Nicobar	N/A	N/A
India	Andhra Pradesh	1.0	21.8
India	Arunachal Pradesh	0.5	17.6
India	Assam	0.2	19.9
India	Bihar	1.0	12.5
India	Chandigarh	N/A	N/A
India	Chhattisgarh	0.9	25.7
India	Dadra and Nagar Haveli	0.1	9.0
India	Daman and Diu	N/A	N/A
India	Goa	0.4	31.9
India	Gujarat	0.3	11.6
India	Haryana	N/A	N/A
India	Himachal Pradesh	3.2	15.5

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
India	Jammu and Kashmir	3.0	12.0
India	Jharkhand	1.2	16.0
India	Karnataka	0.2	26.9
India	Kerala	0.1	24.8
India	Lakshadweep	N/A	N/A
India	Madhya Pradesh	1.4	14.6
India	Maharashtra	1.1	25.1
India	Manipur	0.2	25.0
India	Meghalaya	0.2	30.9
India	Mizoram	0.0	22.8
India	Nagaland	0.3	23.8
India	National Capital Territory of Delhi	N/A	N/A
India	Odisha	0.6	22.6
India	Puducherry	N/A	N/A
India	Punjab	1.3	10.6
India	Rajasthan	N/A	N/A
India	Sikkim	1.7	12.9
India	Tamil Nadu	0.5	15.9
India	Telangana	0.9	27.4
India	Tripura	1.0	37.8
India	Uttar Pradesh	0.5	8.3
India	Uttarakhand	2.2	14.7
India	West Bengal	1.1	17.5
Indonesia	Aceh	1.2	26.1
Indonesia	Bali	N/A	N/A
Indonesia	Bangka Belitung	4.5	28.0
Indonesia	Banten	1.6	32.2
Indonesia	Bengkulu	0.7	28.8
Indonesia	Gorontalo	N/A	N/A
Indonesia	Jakarta Raya	0.2	18.5
Indonesia	Jambi	1.0	27.9
Indonesia	Jawa Barat	0.7	24.4
Indonesia	Jawa Tengah	0.4	24.1
Indonesia	Jawa Timur	1.1	24.0
Indonesia	Kalimantan Barat	2.4	26.1
Indonesia	Kalimantan Selatan	5.6	27.2
Indonesia	Kalimantan Tengah	6.1	22.2
Indonesia	Kalimantan Timur	0.5	26.8

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Indonesia	Kalimantan Utara	0.5	24.1
Indonesia	Kepulauan Riau	N/A	N/A
Indonesia	Lampung	0.4	20.4
Indonesia	Maluku	3.4	23.7
Indonesia	Maluku Utara	4.2	24.6
Indonesia	Nusa Tenggara Barat	2.9	29.1
Indonesia	Nusa Tenggara Timur	1.4	31.7
Indonesia	Papua	3.2	20.1
Indonesia	Papua Barat	0.9	20.9
Indonesia	Riau	1.5	25.0
Indonesia	Sulawesi Barat	1.4	27.3
Indonesia	Sulawesi Selatan	1.9	25.7
Indonesia	Sulawesi Tengah	3.5	24.8
Indonesia	Sulawesi Tenggara	0.8	21.4
Indonesia	Sulawesi Utara	N/A	N/A
Indonesia	Sumatera Barat	0.5	27.1
Indonesia	Sumatera Selatan	1.9	30.2
Indonesia	Sumatera Utara	0.6	25.9
Indonesia	Yogyakarta	0.2	23.3
Iran (Islamic Republic of)	Alborz	N/A	N/A
Iran (Islamic Republic of)	Ardebil	2.8	16.7
Iran (Islamic Republic of)	Bushehr	N/A	N/A
Iran (Islamic Republic of)	Chahar Mahall and Bakhtiari	N/A	N/A
Iran (Islamic Republic of)	East Azarbaijan	N/A	N/A
Iran (Islamic Republic of)	Esfahan	N/A	N/A
Iran (Islamic Republic of)	Fars	N/A	N/A
Iran (Islamic Republic of)	Gilan	5.5	18.3
Iran (Islamic Republic of)	Golestan	4.2	12.0
Iran (Islamic Republic of)	Hamadan	N/A	N/A
Iran (Islamic Republic of)	Hormozgan	N/A	N/A
Iran (Islamic Republic of)	Ilam	N/A	N/A
Iran (Islamic Republic of)	Kerman	N/A	N/A
Iran (Islamic Republic of)	Kermanshah	N/A	N/A
Iran (Islamic Republic of)	Khuzestan	N/A	N/A
Iran (Islamic Republic of)	Kohgiluyeh and Boyer Ahmad	N/A	N/A
Iran (Islamic Republic of)	Kordestan	N/A	N/A
Iran (Islamic Republic of)	Lorestan	N/A	N/A

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Iran (Islamic Republic of)	Markazi	N/A	N/A
Iran (Islamic Republic of)	Mazandaran	4.6	18.4
Iran (Islamic Republic of)	North Khorasan	12.7	23.3
Iran (Islamic Republic of)	Qazvin	4.3	7.0
Iran (Islamic Republic of)	Qom	N/A	N/A
Iran (Islamic Republic of)	Razavi Khorasan	N/A	N/A
Iran (Islamic Republic of)	Semnan	4.9	13.1
Iran (Islamic Republic of)	Sistan and Baluchestan	N/A	N/A
Iran (Islamic Republic of)	South Khorasan	N/A	N/A
Iran (Islamic Republic of)	Tehran	4.5	9.8
Iran (Islamic Republic of)	West Azarbaijan	N/A	N/A
Iran (Islamic Republic of)	Yazd	N/A	N/A
Iran (Islamic Republic of)	Zanjan	N/A	N/A
Iraq	Al-Anbar	N/A	N/A
Iraq	Al-Basrah	N/A	N/A
Iraq	Al-Muthanna	N/A	N/A
Iraq	Al-Qadisiyah	N/A	N/A
Iraq	An-Najaf	N/A	N/A
Iraq	Erbil	N/A	N/A
Iraq	As-Sulaymaniyah	N/A	N/A
Iraq	At-Ta'mim	N/A	N/A
Iraq	Babil	N/A	N/A
Iraq	Baghdad	N/A	N/A
Iraq	Dhi-Qar	N/A	N/A
Iraq	Dihok	N/A	N/A
Iraq	Diyala	N/A	N/A
Iraq	Karbala	N/A	N/A
Iraq	Maysan	N/A	N/A
Iraq	Ninawa	N/A	N/A
Iraq	Salah ad-Din	N/A	N/A
Iraq	Wasit	N/A	N/A
Jamaica	Clarendon	N/A	N/A
Jamaica	Hanover	1.2	41.1
Jamaica	Kingston	N/A	N/A
Jamaica	Manchester	0.5	15.2
Jamaica	Portland	N/A	N/A
Jamaica	Saint Andrew	N/A	N/A
Jamaica	Saint Ann	N/A	N/A
Jamaica	Saint Catherine	N/A	N/A

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Jamaica	Saint Elizabeth	0.5	15.0
Jamaica	Saint James	N/A	N/A
Jamaica	Saint Mary	N/A	N/A
Jamaica	Saint Thomas	N/A	N/A
Jamaica	Trelawny	1.2	38.1
Jamaica	Westmoreland	1.3	36.6
Jordan	Ajlun	N/A	N/A
Jordan	Amman	N/A	N/A
Jordan	Aqaba	N/A	N/A
Jordan	Balqa	N/A	N/A
Jordan	Irbid	N/A	N/A
Jordan	Jarash	N/A	N/A
Jordan	Karak	N/A	N/A
Jordan	Ma'an	N/A	N/A
Jordan	Madaba	N/A	N/A
Jordan	Mafrq	N/A	N/A
Jordan	Tafilah	N/A	N/A
Jordan	Zarqa	N/A	N/A
Kazakhstan	Almaty	8.9	5.9
Kazakhstan	Aqmola	5.6	10.9
Kazakhstan	Aqtöbe	6.6	22.4
Kazakhstan	Atyrau	N/A	N/A
Kazakhstan	East Kazakhstan	4.5	12.5
Kazakhstan	Mangghystau	N/A	N/A
Kazakhstan	North Kazakhstan	1.6	9.6
Kazakhstan	Pavlodar	10.6	19.6
Kazakhstan	Qaraghandy	N/A	N/A
Kazakhstan	Qostanay	2.0	7.5
Kazakhstan	Qyzylorda	N/A	N/A
Kazakhstan	South Kazakhstan	N/A	N/A
Kazakhstan	West Kazakhstan	4.5	19.5
Kazakhstan	Zhambyl	8.1	4.8
Kenya	Baringo	0.1	7.6
Kenya	Bomet	0.0	10.1
Kenya	Bungoma	0.0	8.8
Kenya	Busia	0.0	8.4
Kenya	Elgeyo-Marakwet	0.0	7.4
Kenya	Embu	0.0	7.6
Kenya	Garissa	0.0	5.2

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Kenya	Homa Bay	0.0	7.5
Kenya	Isiolo	N/A	N/A
Kenya	Kajiado	0.2	4.6
Kenya	Kakamega	0.0	8.6
Kenya	Kericho	0.0	10.4
Kenya	Kiambu	0.1	9.3
Kenya	Kilifi	0.0	4.5
Kenya	Kirinyaga	0.0	8.8
Kenya	Kisii	0.0	9.4
Kenya	Kisumu	0.0	8.2
Kenya	Kitui	0.1	5.3
Kenya	Kwale	0.1	7.7
Kenya	Laikipia	0.1	6.2
Kenya	Lamu	0.0	8.2
Kenya	Machakos	0.0	6.2
Kenya	Makueni	0.2	4.6
Kenya	Mandera	N/A	N/A
Kenya	Marsabit	0.7	2.7
Kenya	Meru	0.4	7.2
Kenya	Migori	0.0	8.6
Kenya	Mombasa	N/A	N/A
Kenya	Murang'a	0.0	8.3
Kenya	Nairobi	0.0	5.5
Kenya	Nakuru	0.1	7.9
Kenya	Nandi	0.0	9.0
Kenya	Narok	0.0	8.0
Kenya	Nyamira	0.0	7.4
Kenya	Nyandarua	0.1	8.2
Kenya	Nyeri	0.0	8.0
Kenya	Samburu	1.2	5.0
Kenya	Siaya	0.0	7.8
Kenya	Taita Taveta	0.2	5.9
Kenya	Tana River	0.0	4.2
Kenya	Tharaka-Nithi	0.1	6.8
Kenya	Trans Nzoia	0.0	8.6
Kenya	Turkana	0.2	4.1
Kenya	Uasin Gishu	0.0	8.3
Kenya	Vihiga	0.0	8.6
Kenya	Wajir	N/A	N/A

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Kenya	West Pokot	0.1	8.1
Kyrgyzstan	Batken	N/A	N/A
Kyrgyzstan	Biškeek	13.3	23.8
Kyrgyzstan	Chüy	6.2	7.6
Kyrgyzstan	Jalal-Abad	3.1	7.2
Kyrgyzstan	Naryn	2.9	4.1
Kyrgyzstan	Osh	2.1	7.9
Kyrgyzstan	Osh (city)	N/A	N/A
Kyrgyzstan	Talas	6.4	3.6
Kyrgyzstan	Ysyk-Köl	2.1	4.4
Lao People's Democratic Republic	Attapu	0.1	21.2
Lao People's Democratic Republic	Bokeo	0.1	19.3
Lao People's Democratic Republic	Bolikhamxai	0.1	19.1
Lao People's Democratic Republic	Champasak	0.1	23.7
Lao People's Democratic Republic	Houaphan	0.1	23.0
Lao People's Democratic Republic	Khammouan	0.1	18.4
Lao People's Democratic Republic	Louang Namtha	0.0	18.5
Lao People's Democratic Republic	Louangphrabang	0.0	25.1
Lao People's Democratic Republic	Oudômxai	0.0	21.3
Lao People's Democratic Republic	Phôngsali	0.1	20.1
Lao People's Democratic Republic	Saravan	0.1	23.4
Lao People's Democratic Republic	Savannakhét	0.0	27.3
Lao People's Democratic Republic	Vientiane	0.0	23.6
Lao People's Democratic Republic	Vientiane [prefecture]	0.0	32.4
Lao People's Democratic Republic	Xaignabouri	0.1	24.2
Lao People's Democratic Republic	Xaisômboun	0.0	19.1

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Lao People's Democratic Republic	Xékong	0.0	18.9
Lao People's Democratic Republic	Xiangkhoang	0.0	23.4
Liberia	Bomi	0.1	20.9
Liberia	Bong	0.2	22.5
Liberia	Gbarpolu	0.4	33.1
Liberia	Grand Bassa	0.1	21.2
Liberia	Grand Cape Mount	0.2	29.3
Liberia	Grand Gedeh	0.3	33.3
Liberia	Grand Kru	0.1	27.5
Liberia	Lofa	0.4	33.2
Liberia	Margibi	0.1	19.6
Liberia	Maryland	0.1	21.4
Liberia	Montserrado	0.1	20.3
Liberia	Nimba	0.3	28.0
Liberia	River Gee	0.2	29.5
Liberia	Rivercess	0.2	29.0
Liberia	Sinoe	0.3	33.8
Madagascar	Antananarivo	0.2	6.8
Madagascar	Antsiranana	0.5	14.9
Madagascar	Fianarantsoa	0.6	13.1
Madagascar	Mahajanga	0.6	7.3
Madagascar	Toamasina	0.3	16.8
Madagascar	Toliary	1.1	5.8
Malawi	Balaka	0.1	8.7
Malawi	Blantyre	0.0	7.7
Malawi	Chikwawa	0.1	6.1
Malawi	Chiradzulu	0.0	5.6
Malawi	Chitipa	0.0	9.3
Malawi	Dedza	0.0	8.5
Malawi	Dowa	0.0	5.9
Malawi	Karonga	0.0	8.9
Malawi	Kasungu	0.0	5.6
Malawi	Likoma	N/A	N/A
Malawi	Lilongwe	0.0	7.0
Malawi	Machinga	0.0	8.7
Malawi	Mangochi	0.0	9.3
Malawi	Mchinji	0.0	7.0

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Malawi	Mulanje	0.1	8.3
Malawi	Mwanza	0.0	8.9
Malawi	Mzimba	0.0	9.2
Malawi	Neno	0.0	8.1
Malawi	Nkhata Bay	0.0	8.3
Malawi	Nkhotakota	0.0	8.8
Malawi	Nsanje	0.2	6.8
Malawi	Ntcheu	0.0	8.2
Malawi	Ntchisi	0.0	8.0
Malawi	Phalombe	0.0	6.6
Malawi	Rumphi	0.0	9.3
Malawi	Salima	0.0	8.8
Malawi	Thyolo	0.2	7.5
Malawi	Zomba	0.0	6.0
Malaysia	Johor	2.0	22.7
Malaysia	Kedah	0.0	30.9
Malaysia	Kelantan	0.0	27.3
Malaysia	Kuala Lumpur	0.4	30.7
Malaysia	Labuan	N/A	N/A
Malaysia	Melaka	8.8	30.3
Malaysia	Negeri Sembilan	1.6	27.0
Malaysia	Pahang	0.2	26.8
Malaysia	Perak	0.2	29.1
Malaysia	Perlis	0.1	29.6
Malaysia	Pulau Pinang	N/A	N/A
Malaysia	Putrajaya	0.5	19.8
Malaysia	Sabah	0.5	24.3
Malaysia	Sarawak	0.6	25.1
Malaysia	Selangor	0.7	25.0
Malaysia	Trengganu	0.1	28.2
Mali	Bamako	0.0	5.3
Mali	Gao	N/A	N/A
Mali	Kayes	0.0	3.5
Mali	Kidal	N/A	N/A
Mali	Koulikoro	0.0	6.1
Mali	Mopti	N/A	N/A
Mali	Ségou	0.0	8.7
Mali	Sikasso	0.0	8.9
Mali	Timbuktu	N/A	N/A

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Mauritania	Adrar	N/A	N/A
Mauritania	Assaba	N/A	N/A
Mauritania	Brakna	N/A	N/A
Mauritania	Dakhlet Nouadhibou	N/A	N/A
Mauritania	Gorgol	N/A	N/A
Mauritania	Guidimaka	N/A	N/A
Mauritania	Hodh ech Chargui	N/A	N/A
Mauritania	Hodh el Gharbi	N/A	N/A
Mauritania	Inchiri	N/A	N/A
Mauritania	Nouakchott	N/A	N/A
Mauritania	Tagant	N/A	N/A
Mauritania	Tiris Zemmour	N/A	N/A
Mauritania	Trarza	N/A	N/A
Mexico	Aguascalientes	0.8	7.8
Mexico	Baja California	53.5	1.3
Mexico	Baja California Sur	N/A	N/A
Mexico	Campeche	10.7	31.5
Mexico	Chiapas	4.2	22.8
Mexico	Chihuahua	1.4	1.0
Mexico	Coahuila	4.2	5.7
Mexico	Colima	2.2	16.7
Mexico	Distrito Federal	0.4	9.5
Mexico	Durango	1.2	2.9
Mexico	Guanajuato	2.4	8.4
Mexico	Guerrero	1.2	11.6
Mexico	Hidalgo	4.1	8.1
Mexico	Jalisco	1.7	8.9
Mexico	México	2.7	8.2
Mexico	Michoacán	2.2	10.5
Mexico	Morelos	3.9	10.1
Mexico	Nayarit	1.5	7.8
Mexico	Nuevo León	3.9	7.9
Mexico	Oaxaca	4.1	14.8
Mexico	Puebla	4.2	9.4
Mexico	Querétaro	2.2	5.1
Mexico	Quintana Roo	11.0	36.4
Mexico	San Luis Potosí	4.2	10.6
Mexico	Sinaloa	0.7	12.0
Mexico	Sonora	1.7	3.0

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Mexico	Tabasco	2.2	12.3
Mexico	Tamaulipas	4.7	12.1
Mexico	Tlaxcala	3.4	4.1
Mexico	Veracruz	1.9	11.0
Mexico	Yucatán	3.3	26.6
Mexico	Zacatecas	1.0	3.3
Mongolia	Arhangay	8.8	3.8
Mongolia	Bayan-Ölgiy	N/A	N/A
Mongolia	Bayanhongor	N/A	N/A
Mongolia	Bulgan	15.8	6.1
Mongolia	Darhan-Uul	19.0	16.1
Mongolia	Dornod	13.1	3.3
Mongolia	Dornogovi	N/A	N/A
Mongolia	Dundgovi	N/A	N/A
Mongolia	Dzavhan	23.5	2.9
Mongolia	Govi-Altay	N/A	N/A
Mongolia	Govisumber	N/A	N/A
Mongolia	Hentiy	18.3	3.4
Mongolia	Hovd	N/A	N/A
Mongolia	Hövsgöl	15.3	2.7
Mongolia	Ömnögovi	N/A	N/A
Mongolia	Orhon	N/A	N/A
Mongolia	Övörhangay	N/A	N/A
Mongolia	Selenge	15.4	4.9
Mongolia	Sühbaatar	N/A	N/A
Mongolia	Töv	13.5	2.7
Mongolia	Ulaanbaatar	N/A	N/A
Mongolia	Uvs	N/A	N/A
Mozambique	Cabo Delgado	0.1	10.9
Mozambique	Gaza	0.2	3.5
Mozambique	Inhambane	0.5	6.0
Mozambique	Manica	0.1	6.9
Mozambique	Maputo	0.3	4.8
Mozambique	Maputo City	N/A	N/A
Mozambique	Nampula	0.0	9.1
Mozambique	Nassa	0.1	9.1
Mozambique	Sofala	0.2	8.7
Mozambique	Tete	0.0	7.3
Mozambique	Zambezia	0.1	8.5

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Myanmar	Ayeyarwady	0.1	14.7
Myanmar	Bago	0.2	23.4
Myanmar	Chin	0.1	33.8
Myanmar	Kachin	0.3	15.4
Myanmar	Kayah	0.2	36.1
Myanmar	Kayin	0.1	23.2
Myanmar	Magway	0.2	25.4
Myanmar	Mandalay	0.6	30.8
Myanmar	Mon	0.2	38.4
Myanmar	Naypyitaw	0.1	11.1
Myanmar	Rakhine	0.2	23.1
Myanmar	Sagaing	0.2	22.3
Myanmar	Shan	0.4	35.8
Myanmar	Tanintharyi	0.2	19.8
Myanmar	Yangon	0.3	38.6
Namibia	Kharas	N/A	N/A
Namibia	Erongo	N/A	N/A
Namibia	Hardap	N/A	N/A
Namibia	Kavango	0.0	5.5
Namibia	Khomas	N/A	N/A
Namibia	Kunene	0.7	4.6
Namibia	Ohangwena	0.0	6.8
Namibia	Omaheke	N/A	N/A
Namibia	Omusati	N/A	N/A
Namibia	Oshana	N/A	N/A
Namibia	Oshikoto	0.1	4.9
Namibia	Otjozondjupa	0.4	5.2
Namibia	Zambezi	0.0	3.3
Nepal	Central	0.0	2.6
Nepal	East	2.6	22.0
Nepal	Far-Western	3.1	21.3
Nepal	Mid-Western	2.0	19.8
Nepal	West	1.7	22.5
Nicaragua	Atlántico Norte	2.6	29.9
Nicaragua	Atlántico Sur	2.2	23.0
Nicaragua	Boaco	0.2	13.3
Nicaragua	Carazo	0.7	11.8
Nicaragua	Chinandega	0.7	13.1
Nicaragua	Chontales	0.2	12.4

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Nicaragua	Estelí	0.7	11.5
Nicaragua	Granada	1.5	22.3
Nicaragua	Jinotega	1.2	28.8
Nicaragua	Lago Nicaragua	0.5	12.2
Nicaragua	León	0.6	12.2
Nicaragua	Madriz	1.0	13.1
Nicaragua	Managua	0.4	12.5
Nicaragua	Masaya	0.5	12.1
Nicaragua	Matagalpa	0.3	12.9
Nicaragua	Nueva Segovia	0.9	11.6
Nicaragua	Río San Juan	1.0	19.5
Nicaragua	Rivas	1.3	17.7
Niger	Agadez	N/A	N/A
Niger	Diffa	N/A	N/A
Niger	Dosso	0.0	8.4
Niger	Maradi	N/A	N/A
Niger	Niamey	N/A	N/A
Niger	Tahoua	N/A	N/A
Niger	Tillabéry	0.0	2.8
Niger	Zinder	N/A	N/A
Nigeria	Abia	0.0	11.2
Nigeria	Adamawa	0.0	10.0
Nigeria	Akwa Ibom	0.0	11.6
Nigeria	Anambra	0.0	11.8
Nigeria	Bauchi	0.0	6.7
Nigeria	Bayelsa	0.2	39.2
Nigeria	Benue	0.0	11.0
Nigeria	Borno	0.0	3.7
Nigeria	Cross River	0.1	23.3
Nigeria	Delta	0.2	19.1
Nigeria	Ebonyi	0.0	12.0
Nigeria	Edo	0.1	17.3
Nigeria	Ekiti	0.0	19.4
Nigeria	Enugu	0.0	12.3
Nigeria	Federal Capital Territory	0.0	10.6
Nigeria	Gombe	0.0	4.8
Nigeria	Imo	0.0	11.5
Nigeria	Jigawa	0.0	1.8
Nigeria	Kaduna	0.0	10.0

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Nigeria	Kano	0.0	8.7
Nigeria	Katsina	0.0	8.6
Nigeria	Kebbi	0.0	10.3
Nigeria	Kogi	0.0	11.9
Nigeria	Kwara	0.0	10.8
Nigeria	Lagos	N/A	N/A
Nigeria	Nasarawa	0.0	10.4
Nigeria	Niger	0.0	10.6
Nigeria	Ogun	0.0	12.7
Nigeria	Ondo	0.0	19.0
Nigeria	Osun	0.0	17.7
Nigeria	Oyo	0.0	11.0
Nigeria	Plateau	0.0	11.0
Nigeria	Rivers	0.1	16.9
Nigeria	Sokoto	0.0	10.4
Nigeria	Taraba	0.0	13.1
Nigeria	Yobe	0.0	1.4
Nigeria	Zamfara	0.0	9.4
Pakistan	Azad Kashmir	2.6	8.0
Pakistan	Balochistan	N/A	N/A
Pakistan	Federally Administered Tribal Area	9.9	3.9
Pakistan	Gilgit-Baltistan	2.4	3.6
Pakistan	Islamabad	N/A	N/A
Pakistan	Khyber-Pakhtunkhwa	2.5	5.9
Pakistan	Punjab	1.3	10.6
Pakistan	Sindh	N/A	N/A
Panama	Bocas del Toro	N/A	N/A
Panama	Chiriquí	0.9	11.5
Panama	Coclé	0.9	16.8
Panama	Colón	4.8	35.0
Panama	Darién	10.0	30.2
Panama	Emberá	11.3	34.9
Panama	Herrera	0.8	13.1
Panama	Kuna Yala	2.8	48.3
Panama	Los Santos	0.5	13.6
Panama	Ngöbe Buglé	3.9	29.1
Panama	Panamá	1.2	43.7
Panama	Panamá Oeste	1.3	24.7

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Panama	Veraguas	1.0	16.3
Papua New Guinea	Bougainville	N/A	N/A
Papua New Guinea	Central	0.0	2.6
Papua New Guinea	Chimbu	0.9	21.0
Papua New Guinea	East New Britain	N/A	N/A
Papua New Guinea	East Sepik	1.2	26.9
Papua New Guinea	Eastern Highlands	1.1	21.5
Papua New Guinea	Enga	1.6	14.0
Papua New Guinea	Gulf	3.6	15.8
Papua New Guinea	Hela	0.7	16.3
Papua New Guinea	Jiwaka	0.8	21.4
Papua New Guinea	Madang	1.0	20.7
Papua New Guinea	Manus	N/A	N/A
Papua New Guinea	Milne Bay	0.7	17.2
Papua New Guinea	Morobe	0.7	20.1
Papua New Guinea	National Capital District	N/A	N/A
Papua New Guinea	New Ireland	N/A	N/A
Papua New Guinea	Oro	0.6	14.5
Papua New Guinea	Sandaun	0.4	20.1
Papua New Guinea	Southern Highlands	0.6	17.1
Papua New Guinea	West New Britain	N/A	N/A
Papua New Guinea	Western	N/A	N/A
Papua New Guinea	Western Highlands	1.0	21.4
Peru	Amazonas	9.6	32.1
Peru	Ancash	0.9	4.9
Peru	Apurímac	2.2	5.4
Peru	Arequipa	N/A	N/A
Peru	Ayacucho	2.8	21.5
Peru	Cajamarca	4.0	12.6
Peru	Callao	N/A	N/A
Peru	Cusco	4.3	27.8
Peru	Huancavelica	3.2	9.6
Peru	Huánuco	3.5	35.8
Peru	Ica	N/A	N/A
Peru	Junín	3.9	35.4
Peru	La Libertad	1.9	15.5
Peru	Lambayeque	4.1	3.3
Peru	Lima	N/A	N/A
Peru	Lima Province	N/A	N/A

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Peru	Loreto	2.6	33.1
Peru	Madre de Dios	3.6	33.4
Peru	Moquegua	N/A	N/A
Peru	Pasco	2.4	36.8
Peru	Piura	3.3	12.4
Peru	Puno	9.3	21.1
Peru	San Martín	3.0	37.7
Peru	Tacna	N/A	N/A
Peru	Tumbes	2.5	21.1
Peru	Ucayali	1.9	38.1
Philippines	Abra	0.1	17.5
Philippines	Agusan del Norte	0.9	29.0
Philippines	Agusan del Sur	0.4	24.5
Philippines	Aklan	0.5	31.0
Philippines	Albay	0.7	27.2
Philippines	Antique	N/A	N/A
Philippines	Apayao	0.1	21.1
Philippines	Aurora	0.3	20.9
Philippines	Basilan	N/A	N/A
Philippines	Bataan	N/A	N/A
Philippines	Batanes	N/A	N/A
Philippines	Batangas	N/A	N/A
Philippines	Benguet	0.1	28.3
Philippines	Biliran	0.7	21.5
Philippines	Bohol	0.4	41.8
Philippines	Bukidnon	0.6	21.4
Philippines	Bulacan	0.2	23.4
Philippines	Cagayan	0.3	24.3
Philippines	Camarines Norte	0.7	26.4
Philippines	Camarines Sur	0.4	18.2
Philippines	Camiguin	N/A	N/A
Philippines	Capiz	0.4	29.8
Philippines	Catanduanes	N/A	N/A
Philippines	Cavite	N/A	N/A
Philippines	Cebu	0.2	38.7
Philippines	Compostela Valley	0.4	26.6
Philippines	Davao del Norte	0.3	27.8
Philippines	Davao del Sur	0.3	28.5
Philippines	Davao Oriental	0.8	39.0

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Philippines	Dinagat Islands	N/A	N/A
Philippines	Eastern Samar	N/A	N/A
Philippines	Guimaras	N/A	N/A
Philippines	Ifugao	0.2	30.3
Philippines	Ilocos Norte	N/A	N/A
Philippines	Ilocos Sur	0.1	30.7
Philippines	Iloilo	0.3	35.8
Philippines	Isabela	0.2	25.5
Philippines	Kalinga	0.2	27.3
Philippines	La Union	0.1	39.7
Philippines	Laguna	N/A	N/A
Philippines	Lanao del Norte	0.7	26.8
Philippines	Lanao del Sur	0.7	21.2
Philippines	Leyte	0.2	26.9
Philippines	Maguindanao	0.3	22.0
Philippines	Marinduque	N/A	N/A
Philippines	Masbate	N/A	N/A
Philippines	Metropolitan Manila	N/A	N/A
Philippines	Misamis Occidental	0.6	30.0
Philippines	Misamis Oriental	0.4	23.3
Philippines	Mountain Province	0.1	22.8
Philippines	Negros Occidental	0.3	32.6
Philippines	Negros Oriental	0.4	39.6
Philippines	North Cotabato	0.4	23.1
Philippines	Northern Samar	0.5	27.4
Philippines	Nueva Ecija	0.1	19.0
Philippines	Nueva Vizcaya	0.2	31.4
Philippines	Occidental Mindoro	N/A	N/A
Philippines	Oriental Mindoro	N/A	N/A
Philippines	Palawan	N/A	N/A
Philippines	Pampanga	0.1	19.8
Philippines	Pangasinan	0.1	26.7
Philippines	Quezon	0.5	35.7
Philippines	Quirino	0.2	23.8
Philippines	Rizal	N/A	N/A
Philippines	Romblon	N/A	N/A
Philippines	Samar	0.6	32.2
Philippines	Sarangani	0.3	23.6
Philippines	Siquijor	N/A	N/A

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Philippines	Sorsogon	0.6	34.0
Philippines	South Cotabato	0.2	31.1
Philippines	Southern Leyte	N/A	N/A
Philippines	Sultan Kudarat	0.1	21.3
Philippines	Sulu	N/A	N/A
Philippines	Surigao del Norte	2.8	35.0
Philippines	Surigao del Sur	0.9	26.3
Philippines	Tarlac	0.1	13.8
Philippines	Tawi-Tawi	N/A	N/A
Philippines	Zambales	N/A	N/A
Philippines	Zamboanga del Norte	0.4	29.1
Philippines	Zamboanga del Sur	0.3	22.9
Philippines	Zamboanga Sibugay	0.4	35.3
Rwanda	Amajyaruguru	0.1	9.9
Rwanda	Amajyepfo	0.0	11.1
Rwanda	Iburasirazuba	0.0	9.0
Rwanda	Iburengerazuba	0.1	17.2
Rwanda	Umujiyi wa Kigali	0.0	7.8
Senegal	Dakar	N/A	N/A
Senegal	Diourbel	N/A	N/A
Senegal	Fatick	0.1	2.0
Senegal	Kaffrine	0.0	4.6
Senegal	Kaolack	0.0	1.7
Senegal	Kédougou	0.0	4.8
Senegal	Kolda	0.0	7.5
Senegal	Louga	N/A	N/A
Senegal	Matam	N/A	N/A
Senegal	Saint-Louis	N/A	N/A
Senegal	Sédhiou	0.0	7.4
Senegal	Tambacounda	0.0	3.5
Senegal	Thiès	N/A	N/A
Senegal	Ziguinchor	0.0	5.4
Sierra Leone	Eastern	N/A	N/A
Sierra Leone	Northern	N/A	N/A
Sierra Leone	Southern	N/A	N/A
Sierra Leone	Western	N/A	N/A
Somalia	Awdal	N/A	N/A
Somalia	Bakool	N/A	N/A
Somalia	Bari	N/A	N/A

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Somalia	Bay	0.0	2.5
Somalia	Galguduud	N/A	N/A
Somalia	Gedo	N/A	N/A
Somalia	Hiiraan	N/A	N/A
Somalia	Jubbada Dhexe	0.0	3.8
Somalia	Jubbada Hoose	0.0	4.3
Somalia	Mudug	N/A	N/A
Somalia	Nugaal	N/A	N/A
Somalia	Sanaag	N/A	N/A
Somalia	Shabeellaha Dhexe	N/A	N/A
Somalia	Shabeellaha Hoose	0.0	4.2
Somalia	Sool	N/A	N/A
Somalia	Togdheer	N/A	N/A
Somalia	Banaadir	N/A	N/A
South Africa	Eastern Cape	1.2	5.9
South Africa	Free State	0.0	4.3
South Africa	Gauteng	0.1	2.6
South Africa	KwaZulu-Natal	0.2	6.2
South Africa	Limpopo	0.1	3.2
South Africa	Mpumalanga	0.1	4.8
South Africa	North West	0.1	3.4
South Africa	Northern Cape	N/A	N/A
South Africa	Western Cape	9.8	4.9
South Sudan	Central Equatoria	0.0	7.5
South Sudan	Eastern Equatoria	0.0	6.8
South Sudan	Jungoli	0.1	3.3
South Sudan	Lakes	0.0	6.6
South Sudan	North Bahr-al-Ghazal	0.0	4.6
South Sudan	Unity	0.1	3.1
South Sudan	Upper Nile	0.1	3.0
South Sudan	Warap	0.0	7.4
South Sudan	West Bahr-al-Ghazal	0.0	7.5
South Sudan	West Equatoria	0.0	10.5
Sri Lanka	Ampara	0.3	24.8
Sri Lanka	Anuradhapura	0.4	34.8
Sri Lanka	Badulla	0.3	34.3
Sri Lanka	Batticaloa	0.2	14.4
Sri Lanka	Colombo	N/A	N/A
Sri Lanka	Galle	N/A	N/A

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Sri Lanka	Gampaha	0.2	39.1
Sri Lanka	Hambantota	N/A	N/A
Sri Lanka	Jaffna	N/A	N/A
Sri Lanka	Kalutara	N/A	N/A
Sri Lanka	Kandy	0.2	29.9
Sri Lanka	Kegalle	0.2	34.8
Sri Lanka	Kilinochchi	0.1	9.2
Sri Lanka	Kurunegala	0.1	28.3
Sri Lanka	Mannar	0.6	28.2
Sri Lanka	Matale	0.2	23.7
Sri Lanka	Matara	N/A	N/A
Sri Lanka	Moneragala	0.4	34.9
Sri Lanka	Mullaitivu	0.4	29.6
Sri Lanka	Nuwara Eliya	0.2	26.6
Sri Lanka	Polonnaruwa	0.3	27.3
Sri Lanka	Puttalam	0.1	31.4
Sri Lanka	Ratnapura	0.2	34.3
Sri Lanka	Trincomalee	0.7	31.5
Sri Lanka	Vavuniya	0.5	32.0
Sudan	Al Jazirah	N/A	N/A
Sudan	Al Qadarif	0.0	2.1
Sudan	Blue Nile	0.0	4.0
Sudan	Central Darfur	0.0	8.2
Sudan	East Darfur	0.0	6.6
Sudan	Kassala	N/A	N/A
Sudan	Khartoum	N/A	N/A
Sudan	North Darfur	N/A	N/A
Sudan	North Kurdufan	N/A	N/A
Sudan	Northern	N/A	N/A
Sudan	Red Sea	N/A	N/A
Sudan	River Nile	N/A	N/A
Sudan	Sennar	0.0	4.6
Sudan	South Darfur	0.0	5.4
Sudan	South Kurdufan	0.1	5.3
Sudan	West Darfur	N/A	N/A
Sudan	West Kurdufan	0.0	6.4
Sudan	White Nile	N/A	N/A
Syrian Arab Republic	Al Hasakah	N/A	N/A
Syrian Arab Republic	Aleppo	14.1	35.7

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Syrian Arab Republic	Ar Raqqa	N/A	N/A
Syrian Arab Republic	As Suwayda	N/A	N/A
Syrian Arab Republic	Damascus	N/A	N/A
Syrian Arab Republic	Dar'a	N/A	N/A
Syrian Arab Republic	Dayr Az Zawr	N/A	N/A
Syrian Arab Republic	Hamah	19.8	23.5
Syrian Arab Republic	Hims	N/A	N/A
Syrian Arab Republic	Idlib	16.3	25.1
Syrian Arab Republic	Lattakia	16.0	18.0
Syrian Arab Republic	Quneitra	N/A	N/A
Syrian Arab Republic	Rif Dimashq	N/A	N/A
Syrian Arab Republic	Tartus	N/A	N/A
Tajikistan	Districts of Republican Subordination	N/A	N/A
Tajikistan	Dushanbe	N/A	N/A
Tajikistan	Gorno-Badakhshan	N/A	N/A
Tajikistan	Khatlon	N/A	N/A
Tajikistan	Sughd	12.1	8.8
Thailand	Amnat Charoen	0.1	17.2
Thailand	Ang Thong	N/A	N/A
Thailand	Bangkok Metropolis	0.5	20.7
Thailand	Bueng Kan	0.1	16.9
Thailand	Buri Ram	0.1	17.5
Thailand	Chachoengsao	0.0	15.5
Thailand	Chai Nat	0.1	15.7
Thailand	Chaiyaphum	0.1	17.9
Thailand	Chanthaburi	0.0	26.6
Thailand	Chiang Mai	0.3	29.7
Thailand	Chiang Rai	0.2	25.0
Thailand	Chon Buri	0.0	21.0
Thailand	Chumphon	0.2	38.1
Thailand	Kalasin	0.1	15.2
Thailand	Kamphaeng Phet	0.1	17.6
Thailand	Kanchanaburi	0.1	23.3
Thailand	Khon Kaen	0.2	18.4
Thailand	Krabi	0.1	39.2
Thailand	Lampang	0.3	36.7
Thailand	Lamphun	0.4	41.3
Thailand	Loei	0.2	35.3

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Thailand	Lop Buri	0.1	13.4
Thailand	Mae Hong Son	0.2	29.3
Thailand	Maha Sarakham	N/A	N/A
Thailand	Mukdahan	0.1	19.2
Thailand	Nakhon Nayok	0.2	20.8
Thailand	Nakhon Pathom	0.5	40.9
Thailand	Nakhon Phanom	0.1	17.3
Thailand	Nakhon Ratchasima	0.1	16.3
Thailand	Nakhon Sawan	0.1	16.1
Thailand	Nakhon Si Thammarat	0.0	31.2
Thailand	Nan	0.1	29.5
Thailand	Narathiwat	0.1	33.5
Thailand	Nong Bua Lam Phu	0.2	18.4
Thailand	Nong Khai	0.1	23.0
Thailand	Nonthaburi	N/A	N/A
Thailand	Pathum Thani	0.8	30.3
Thailand	Pattani	0.4	35.7
Thailand	Phangnga	0.7	36.0
Thailand	Phatthalung	0.0	25.4
Thailand	Phayao	0.1	20.6
Thailand	Phetchabun	0.2	26.6
Thailand	Phetchaburi	0.0	17.6
Thailand	Phichit	0.1	15.9
Thailand	Phitsanulok	0.1	28.6
Thailand	Phra Nakhon Si Ayutthaya	1.2	43.3
Thailand	Phrae	0.2	40.0
Thailand	Phuket	N/A	N/A
Thailand	Prachin Buri	0.0	21.4
Thailand	Prachuap Khiri Khan	0.0	15.6
Thailand	Ranong	0.3	30.9
Thailand	Ratchaburi	0.1	25.7
Thailand	Rayong	0.0	37.0
Thailand	Roi Et	N/A	N/A
Thailand	Sa Kaeo	0.0	16.2
Thailand	Sakon Nakhon	0.2	17.9
Thailand	Samut Prakan	N/A	N/A
Thailand	Samut Sakhon	N/A	N/A
Thailand	Samut Songkhram	0.2	35.0

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Thailand	Saraburi	0.2	22.1
Thailand	Satun	0.2	29.4
Thailand	Si Sa Ket	0.1	18.3
Thailand	Sing Buri	N/A	N/A
Thailand	Songkhla	0.1	38.8
Thailand	Sukhothai	0.2	27.1
Thailand	Suphan Buri	0.1	24.5
Thailand	Surat Thani	0.2	37.6
Thailand	Surin	0.1	15.6
Thailand	Tak	0.2	26.9
Thailand	Trang	0.0	36.7
Thailand	Trat	0.2	24.7
Thailand	Ubon Ratchathani	0.0	17.6
Thailand	Udon Thani	0.1	22.6
Thailand	Uthai Thani	0.1	20.1
Thailand	Uttaradit	0.2	36.7
Thailand	Yala	0.1	32.6
Thailand	Yasothon	0.1	14.6
Timor-Leste	Aileu	2.2	33.9
Timor-Leste	Ainaro	1.8	30.9
Timor-Leste	Ambeno	2.3	33.8
Timor-Leste	Baucau	N/A	N/A
Timor-Leste	Bobonaro	1.6	38.4
Timor-Leste	Covalima	1.0	35.6
Timor-Leste	Dili	N/A	N/A
Timor-Leste	Ermera	1.9	34.8
Timor-Leste	Lautém	N/A	N/A
Timor-Leste	Liquiçá	N/A	N/A
Timor-Leste	Manatuto	2.6	33.9
Timor-Leste	Manufahi	2.4	33.1
Timor-Leste	Viqueque	N/A	N/A
Togo	Centre	N/A	N/A
Togo	Kara	0.0	9.5
Togo	Maritime	0.8	10.2
Togo	Plateaux	0.9	17.3
Togo	Savanes	0.0	9.9
Türkiye	Adana	2.4	21.3
Türkiye	Adıyaman	N/A	N/A
Türkiye	Afyon	3.9	35.5

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Türkiye	Ağrı	N/A	N/A
Türkiye	Aksaray	N/A	N/A
Türkiye	Amasya	1.2	39.8
Türkiye	Ankara	2.2	40.7
Türkiye	Antalya	4.5	21.4
Türkiye	Ardahan	N/A	N/A
Türkiye	Artvin	0.8	18.5
Türkiye	Aydın	12.8	21.2
Türkiye	Balıkesir	1.9	33.0
Türkiye	Bartın	0.4	15.6
Türkiye	Batman	N/A	N/A
Türkiye	Bayburt	2.2	18.4
Türkiye	Bilecik	3.6	29.3
Türkiye	Bingöl	N/A	N/A
Türkiye	Bitlis	N/A	N/A
Türkiye	Bolu	0.6	22.3
Türkiye	Burdur	7.2	33.9
Türkiye	Bursa	2.7	27.3
Türkiye	Çanakkale	1.8	26.1
Türkiye	Çankırı	1.2	39.1
Türkiye	Çorum	1.1	29.4
Türkiye	Denizli	9.3	31.1
Türkiye	Diyarbakır	N/A	N/A
Türkiye	Düzce	0.4	18.0
Türkiye	Edirne	7.8	13.9
Türkiye	Elazığ	2.8	13.1
Türkiye	Erzincan	6.5	25.0
Türkiye	Erzurum	2.3	18.2
Türkiye	Eskişehir	5.9	30.4
Türkiye	Gaziantep	10.5	30.3
Türkiye	Giresun	1.9	21.9
Türkiye	Gümüşhane	2.2	22.2
Türkiye	Hakkari	N/A	N/A
Türkiye	Hatay	9.4	23.9
Türkiye	Iğdır	N/A	N/A
Türkiye	Isparta	3.7	24.7
Türkiye	İstanbul	N/A	N/A
Türkiye	Izmir	5.6	27.0
Türkiye	Kahramanmaraş	4.4	29.6

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Türkiye	Karabük	0.5	22.1
Türkiye	Karaman	8.4	15.6
Türkiye	Kars	N/A	N/A
Türkiye	Kastamonu	0.8	23.9
Türkiye	Kayseri	2.8	27.3
Türkiye	Kilis	N/A	N/A
Türkiye	Kırıkkale	N/A	N/A
Türkiye	Kırklareli	3.0	20.4
Türkiye	Kırşehir	N/A	N/A
Türkiye	Kocaeli	1.0	15.9
Türkiye	Konya	3.6	15.3
Türkiye	Kütahya	2.5	35.8
Türkiye	Malatya	N/A	N/A
Türkiye	Manisa	2.3	33.9
Türkiye	Mardin	N/A	N/A
Türkiye	Mersin	3.3	30.3
Türkiye	Muğla	8.9	9.0
Türkiye	Muş	N/A	N/A
Türkiye	Nevşehir	N/A	N/A
Türkiye	Niğde	1.8	21.8
Türkiye	Ordu	0.3	10.3
Türkiye	Osmaniye	4.7	21.2
Türkiye	Rize	1.1	17.1
Türkiye	Sakarya	0.7	20.3
Türkiye	Samsun	1.3	30.1
Türkiye	Şanlıurfa	N/A	N/A
Türkiye	Siirt	N/A	N/A
Türkiye	Sinop	2.0	24.8
Türkiye	Şırnak	N/A	N/A
Türkiye	Sivas	3.4	39.8
Türkiye	Tekirdağ	5.5	15.6
Türkiye	Tokat	0.8	21.8
Türkiye	Trabzon	0.9	13.9
Türkiye	Tunceli	4.3	14.8
Türkiye	Uşak	3.3	42.1
Türkiye	Van	N/A	N/A
Türkiye	Yalova	1.3	18.1
Türkiye	Yozgat	1.0	36.5
Türkiye	Zonguldak	0.5	22.8

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Turkmenistan	Ahal	N/A	N/A
Turkmenistan	Aşgabat	N/A	N/A
Turkmenistan	Balkan	N/A	N/A
Turkmenistan	Daşoguz	N/A	N/A
Turkmenistan	Lebap	N/A	N/A
Turkmenistan	Mary	N/A	N/A
Uganda	Adjumani	0.0	9.1
Uganda	Apac	0.0	9.2
Uganda	Arua	0.0	9.6
Uganda	Bugiri	N/A	N/A
Uganda	Bundibugyo	0.0	15.7
Uganda	Bushenyi	0.0	14.6
Uganda	Busia	0.0	8.4
Uganda	Gulu	0.0	8.7
Uganda	Hoima	0.0	12.9
Uganda	Iganga	0.0	8.9
Uganda	Jinja	N/A	N/A
Uganda	Kabale	0.0	10.8
Uganda	Kabarole	0.0	13.1
Uganda	Kaberamaido	0.0	9.3
Uganda	Kalangala	0.0	16.2
Uganda	Kampala	2.5	6.3
Uganda	Kamuli	0.0	8.7
Uganda	Kamwenge	0.0	13.3
Uganda	Kanungu	0.0	17.0
Uganda	Kapchorwa	0.0	11.7
Uganda	Kasese	0.0	13.4
Uganda	Katakwi	0.0	8.3
Uganda	Kayunga	0.0	9.2
Uganda	Kibale	0.0	10.0
Uganda	Kiboga	0.0	9.7
Uganda	Kisoro	0.0	20.6
Uganda	Kitgum	0.0	7.6
Uganda	Kotido	0.1	7.6
Uganda	Kumi	0.0	8.6
Uganda	Kyenjojo	0.0	11.2
Uganda	Lake Albert	0.0	9.3
Uganda	Lake Victoria	0.0	9.5
Uganda	Lira	0.0	9.0

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Uganda	Luwero	0.0	9.9
Uganda	Masaka	0.0	9.6
Uganda	Masindi	0.0	10.9
Uganda	Mayuge	N/A	N/A
Uganda	Mbale	0.0	10.8
Uganda	Mbarara	0.0	9.7
Uganda	Moroto	0.1	7.5
Uganda	Moyo	0.0	8.1
Uganda	Mpigi	0.0	8.8
Uganda	Mubende	0.0	9.7
Uganda	Mukono	0.0	12.2
Uganda	Nakapiripirit	0.0	8.3
Uganda	Nakasongola	0.0	8.9
Uganda	Nebbi	0.0	9.0
Uganda	Ntungamo	0.0	10.1
Uganda	Pader	0.0	9.1
Uganda	Pallisa	0.0	8.6
Uganda	Rakai	0.0	10.6
Uganda	Rukungiri	0.0	16.1
Uganda	Sembabule	0.0	10.1
Uganda	Sironko	0.0	10.5
Uganda	Soroti	7.3	8.4
Uganda	Tororo	0.0	9.1
Uganda	Wakiso	0.0	8.8
Uganda	Yumbe	0.0	9.0
United Republic of Tanzania	Arusha	0.1	6.3
United Republic of Tanzania	Dar es Salaam	N/A	N/A
United Republic of Tanzania	Dodoma	0.1	5.3
United Republic of Tanzania	Geita	0.0	10.3
United Republic of Tanzania	Iringa	0.0	7.4
United Republic of Tanzania	Kagera	0.0	9.4
United Republic of Tanzania	Kaskazini Pemba	N/A	N/A
United Republic of Tanzania	Kaskazini Unguja	N/A	N/A
United Republic of Tanzania	Katavi	0.0	9.7
United Republic of Tanzania	Kigoma	0.0	10.4
United Republic of Tanzania	Kilimanjaro	0.3	7.2
United Republic of Tanzania	Kusini Pemba	N/A	N/A
United Republic of Tanzania	Kusini Unguja	N/A	N/A
United Republic of Tanzania	Lindi	0.0	10.4

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
United Republic of Tanzania	Manyara	0.1	5.5
United Republic of Tanzania	Mara	0.0	8.1
United Republic of Tanzania	Mbeya	0.0	8.6
United Republic of Tanzania	Mjini Magharibi	N/A	N/A
United Republic of Tanzania	Morogoro	0.0	8.6
United Republic of Tanzania	Mtwara	0.0	10.1
United Republic of Tanzania	Mwanza	0.0	8.9
United Republic of Tanzania	Njombe	0.0	8.8
United Republic of Tanzania	Pwani	0.0	9.1
United Republic of Tanzania	Rukwa	0.1	9.3
United Republic of Tanzania	Ruvuma	0.0	9.3
United Republic of Tanzania	Shinyanga	0.0	9.2
United Republic of Tanzania	Simiyu	0.1	7.7
United Republic of Tanzania	Singida	0.0	6.0
United Republic of Tanzania	Songwe	0.0	9.0
United Republic of Tanzania	Tabora	0.0	8.7
United Republic of Tanzania	Tanga	0.1	7.8
Uzbekistan	Andijon	N/A	N/A
Uzbekistan	Buxoro	N/A	N/A
Uzbekistan	Farg'ona	N/A	N/A
Uzbekistan	Jizzax	N/A	N/A
Uzbekistan	Namangan	N/A	N/A
Uzbekistan	Navoiy	N/A	N/A
Uzbekistan	Qaraqalpaqstan	N/A	N/A
Uzbekistan	Qashqadaryo	N/A	N/A
Uzbekistan	Samarqand	N/A	N/A
Uzbekistan	Sirdaryo	12.7	8.2
Uzbekistan	Surxondaryo	N/A	N/A
Uzbekistan	Tashkent	13.4	13.1
Uzbekistan	Tashkent Shahri	N/A	N/A
Uzbekistan	Xorazm	N/A	N/A
Viet Nam	An Giang	0.3	14.4
Viet Nam	Bà Rịa - Vũng Tàu	0.4	11.5
Viet Nam	Bắc Giang	0.4	30.7
Viet Nam	Bắc Kạn	0.4	34.2
Viet Nam	Bạc Liêu	N/A	N/A
Viet Nam	Bắc Ninh	0.1	3.2
Viet Nam	Bến Tre	N/A	N/A
Viet Nam	Bình Định	0.1	20.3

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Viet Nam	Bình Dương	0.4	24.2
Viet Nam	Bình Phước	0.2	28.8
Viet Nam	Bình Thuận	0.1	18.3
Viet Nam	Cà Mau	N/A	N/A
Viet Nam	Cần Thơ	0.6	18.5
Viet Nam	Cao Bằng	0.7	41.7
Viet Nam	Đà Nẵng	0.1	19.1
Viet Nam	Đắk Lắk	0.1	27.3
Viet Nam	Đắk Nông	N/A	N/A
Viet Nam	Điện Biên	0.5	32.0
Viet Nam	Đồng Nai	0.4	24.4
Viet Nam	Đồng Tháp	0.4	13.0
Viet Nam	Gia Lai	0.1	28.1
Viet Nam	Hà Giang	1.1	34.4
Viet Nam	Hà Nam	0.3	8.8
Viet Nam	Hà Nội	0.1	8.9
Viet Nam	Hà Tĩnh	0.6	25.6
Viet Nam	Hải Dương	N/A	N/A
Viet Nam	Hải Phòng	N/A	N/A
Viet Nam	Hậu Giang	0.6	19.0
Viet Nam	Hồ Chí Minh	0.7	21.4
Viet Nam	Hoà Bình	0.2	24.2
Viet Nam	Hưng Yên	0.2	5.3
Viet Nam	Khánh Hòa	0.0	18.0
Viet Nam	Kiên Giang	0.4	13.7
Viet Nam	Kon Tum	0.1	17.8
Viet Nam	Lai Châu	0.3	24.6
Viet Nam	Lâm Đồng	0.1	22.2
Viet Nam	Lạng Sơn	0.4	42.1
Viet Nam	Lào Cai	0.8	36.5
Viet Nam	Long An	0.8	24.0
Viet Nam	Nam Định	N/A	N/A
Viet Nam	Nghệ An	0.3	28.4
Viet Nam	Ninh Bình	0.3	14.9
Viet Nam	Ninh Thuận	0.1	14.1
Viet Nam	Phú Thọ	0.5	30.4
Viet Nam	Phú Yên	0.1	21.5
Viet Nam	Quảng Bình	0.0	20.3
Viet Nam	Quảng Nam	0.1	24.3

Country	Subnational	Reversal risk factor (wildfire) (per cent)	Reversal risk factor (all other natural reversal risks) (per cent)
Viet Nam	Quảng Ngãi	0.1	26.0
Viet Nam	Quảng Ninh	0.7	35.5
Viet Nam	Quảng Trị	0.0	30.2
Viet Nam	Sóc Trăng	0.4	14.1
Viet Nam	Sơn La	0.8	40.6
Viet Nam	Tây Ninh	0.2	20.0
Viet Nam	Thái Bình	N/A	N/A
Viet Nam	Thái Nguyên	0.4	30.9
Viet Nam	Thanh Hóa	0.2	25.9
Viet Nam	Thừa Thiên Huế	N/A	N/A
Viet Nam	Tiền Giang	0.6	15.5
Viet Nam	Trà Vinh	N/A	N/A
Viet Nam	Tuyên Quang	0.3	31.0
Viet Nam	Vĩnh Long	0.7	18.8
Viet Nam	Vĩnh Phúc	0.4	30.4
Viet Nam	Yên Bái	1.0	34.8
Zambia	Central	0.0	2.6
Zambia	Copperbelt	0.0	10.7
Zambia	Eastern	N/A	N/A
Zambia	Luapula	0.0	10.1
Zambia	Lusaka	0.0	8.3
Zambia	Muchinga	0.0	8.9
Zambia	North-Western	0.2	10.3
Zambia	Northern	N/A	N/A
Zambia	Southern	N/A	N/A
Zambia	Western	N/A	N/A
Zimbabwe	Bulawayo	0.0	3.5
Zimbabwe	Harare	0.0	3.2
Zimbabwe	Manicaland	0.1	5.3
Zimbabwe	Mashonaland Central	0.0	6.6
Zimbabwe	Mashonaland East	0.0	5.2
Zimbabwe	Mashonaland West	0.1	6.0
Zimbabwe	Masvingo	0.0	3.5
Zimbabwe	Matabeleland North	0.0	4.2
Zimbabwe	Matabeleland South	0.1	3.1
Zimbabwe	Midlands	0.0	4.7

Appendix 2. Methods used to determine the default factors for natural reversal risks

1. Introduction

2. This section documents the methods and analytical approach used by a technical consultant to the secretariat to develop the default values for natural reversal risk factors in Appendix 1. It was provided by the technical consultant to the secretariat and modified for editorial alignment.

2. Definitions

3. **Above-ground and below-ground carbon in forests:** Forest biomass carbon comprises above-ground carbon stored in stems, branches, bark, and foliage, and below-ground carbon stored in living root systems. No other reservoirs were included.
4. **Definition of forest pixel:** A forest pixel is defined as having more than 10 per cent tree cover in the year 2000.
5. **IPCC risk definition:** The potential for adverse consequences resulting from the interaction of hazards, exposure, and vulnerability (IPCC, 2012).
6. **100-year time horizon for analysis:** Selected based on direction that the Article 6.4 mechanism uses a 100-year time horizon over which reversal risks are calculated, consistent with other carbon crediting mechanisms.
7. **Reversal:** For the purpose of identifying historical forest carbon losses, a reversal was defined as a net loss of at least 10 per cent of live biomass (or carbon) over a given period. This relatively conservative threshold was chosen to account for uncertainties in carbon measurements (Wu *et al.*, 2026a). For the purpose of projecting future reversals to quantify the reversal risk assessment, this analysis considered only severe, stand-replacing natural disturbances. Consequently, this analysis does not include low- and medium-severity disturbance events that cause carbon losses without leading to a stand-replacing disturbance.
8. **Risk:** Following the IPCC definition of risk, the calculation of reversal risk integrates several key elements: the amount of carbon potentially at risk (exposure), the probability of exposed carbon being lost due to disturbance, and the magnitude of carbon lost from disturbance. Reversal risk is expressed as a percentage of forest carbon stock loss due to a given disturbance.

3. Analytical approach

3.1. Grid-based reversal risk estimates in global forests

9. The analytical approach implements the peer-reviewed "absolute reversal" modelling approach from Wu *et al.* (2026a), with updated data to provide global coverage. The analysis involves five key steps, each of which is described below:

- (a) Developing forest growth curves;

- (b) Predicting the probability of disturbance over 10-year intervals;
 - (c) Estimating the amount of carbon lost from disturbance;
 - (d) Calculating the integrated 100-year probability of carbon reversal; and
 - (e) Calculating the biophysical reversal risk, which incorporates three components of risk.
10. The first step involved developing forest growth curves for each 8-km grid by fitting above-ground biomass (AGB) (ESA CCI AGB V4.0; Santoro & Cartus, 2023) as a function of stand age, mean annual temperature, and precipitation (ERA5; Hersbach et al., 2018). Among 10 candidate growth functions fitted using maximum likelihood with gamma-distributed errors, the best-performing model was selected. Models for ecoregions (Xu et al., 2021) with poor fits ($R^2 < 0.15$) were refitted at the biome level (Olson et al., 2001). Models were trained using 70 per cent of grid cells and tested on the remaining 30 per cent.
 11. The second step involved modelling the probability of stand-replacing disturbances. Forest disturbances were mapped using Global Forest Watch data (2001–2022) (Hansen et al., 2013) at an original half-degree resolution and further re-gridded to an 8-km grid. To isolate natural disturbances, tree cover loss associated with land-use change and intensive forest management was excluded, leaving areas affected primarily by wildfire, insects and disease, and windthrow. Disturbance area was converted to annual disturbance probability (per cent yr^{-1}) and modelled using a random forest approach based on historical climate (mean annual temperature and precipitation from ERA5), AGB, and biome. The model explained 43.3 per cent of the variance.
 12. Future disturbance probabilities were projected by rerunning the model with climate projections from 22 CMIP6 Earth system models under two future climate scenarios: a middle-of-the-road scenario (SSP2-4.5) and a high-emissions scenario (SSP5-8.5) (e.g., as documented in Wu et al. (2026a) and Anderegg et al. (2022)). Following a pseudo-global-warming approach, projected climate anomalies were applied to observed ERA5 data to reduce biases in absolute climate projections. Annual disturbance probabilities were then converted to decadal probabilities using a binomial distribution and interpolated across managed forests using inverse distance weighting to generate wall-to-wall reversal risk maps.
 13. The third step estimated carbon losses following disturbance. Because many disturbances are partial rather than stand-replacing, the fraction of biomass lost varies substantially among biomes and disturbance types. To capture this uncertainty, literature-based estimates of carbon loss due to a given disturbance were applied using a scenario analysis. For boreal and temperate forests, low-, moderate-, and high-severity scenarios were used corresponding to 38.5 per cent, 71.6 per cent, and 91.3 per cent carbon loss, respectively (Thom & Seidl, 2016; Whittier & Gray, 2016). For tropical forests, carbon loss values of 45 per cent, 55 per cent, and 65 per cent were used (Bullock & Woodcock, 2021). Following previous studies, it was assumed that the stand age resets to zero after disturbance (Pugh et al., 2019). This results in nine scenarios, combining three disturbance-severity assumptions for tropical forests with three disturbance-severity assumptions for temperate and boreal forests and tropical forests.
 14. The fourth step integrated the growth, disturbance, and severity components into a demographic growth–mortality model on a common 8-km grid to estimate the 100-year

probability of carbon reversal from natural disturbances. Simulations were restricted to areas with more than 10 per cent tree cover in 2000. Forest age was initialized to 2010 and AGB was projected by decade using the best-fitting growth curve for each ecoregion. To account for stochastic disturbance occurrence, 100 Monte Carlo simulations were conducted by sampling binomial disturbance events from projected decadal disturbance probabilities. When a disturbance occurred, AGB was reduced according to the specified severity scenario and stand age was reset to zero. The integrated 100-year reversal probability was then calculated for each grid cell using equations (1) and (2).

$$p10_{reversal}(j) = \frac{N(j)}{100} \quad \text{Equation (1)}$$

15. Where $p10_{reversal}(j)$ is the decadal carbon reversal probability due to natural disturbances for a given 8-km grid, j represents the 2020s, 2030s, ..., 2090s, $N(j)$ is the number of simulations from the total of 100 where (1) a disturbance occurred and (2) the net of AGB loss and regrowth during decade j was 10 per cent or lower than AGB in the 2010s. Here, AGB was used as a proxy for total live biomass carbon to identify a reversal under the 10 per cent threshold because live biomass was approximated as $AGB \times (1 + \text{root:shoot})$. The integrated 100-year carbon reversal probability ($p100_{reversal}$, per cent) due to natural disturbances was calculated using equation (2).

$$p100_{reversal} = 100 \times \left(1 - \prod_{j=2020s}^n (1 - p10_{reversal}(j)) \right) \quad \text{Equation (2)}$$

16. Where n represents the decade of the 2110s (i.e., the final of 10 decades) to integrate probabilities over a full 100-year period. The 100-year period includes eight decades from the 2020s to the 2090s, with the 2080s and 2090s repeated to represent the 2100s and 2110s, respectively, for which climate data are not available.
17. The fifth step calculated the biophysical reversal risk, which provides the absolute magnitude of carbon loss by combining the integrated 100-year carbon reversal probability, disturbance severity (i.e., the ratio of carbon loss where a reversal event occurs due to a given disturbance, depending on the biome: 38.5 per cent, 71.6 per cent, and 91.3 per cent for boreal and temperate forests, and 45 per cent, 55 per cent, and 65 per cent for tropical forests), and a map of total (above-ground and below-ground) live biomass carbon exposure (equation (3)). For total live biomass carbon, a map of global AGB circa 2017 from the ESA CCI AGB product V4.0 (Santoro & Cartus, 2023) and a spatially explicit estimate of root: shoot ratio dataset at approximately 1-km spatial resolution (Huang *et al.*, 2021) were used. All datasets were resampled to a common 8 km × 8 km grid using bilinear interpolation.

$$ReversalRisk_{Abs} = p100_{reversal} \times ratio_{Closs} \times C_{tot} \times 3.667 \quad \text{Equation (3)}$$

18. Where $ReversalRisk_{Abs}$ is the map of biophysical reversal risk (tCO₂eq ha⁻¹) to compensate for disturbance-driven reversals across global forests, $ratio_{Closs}$ is the disturbance severity, C_{tot} is the total (aboveground and belowground) live biomass carbon stocks (t ha⁻¹), and 3.667 is a scaling factor from carbon to CO₂eq.

3.2. Apportioning risk based on regional carbon stocks

19. Translating tonne-based results from equation (3) into a parameter expressed as a percentage of credited carbon stocks, as is commonly used in the design of reversal risk and buffer pools in carbon crediting programmes, depends on the technical details of the applicable methodology and individual activity.
20. The absolute reversal risk calculated by equation (3) was divided by the current regional total live biomass carbon using equation (4). This yielded the reversal risk as a percentage.

$$\text{ReversalRisk} = 100 \times \frac{\text{ReversalRisk}_{Abs}}{\text{TotalC}} \quad \text{Equation (4)}$$

21. Where ReversalRisk is the reversal risk (expressed as a percentage) and TotalC is the regional total live biomass carbon stocks (t ha^{-1}).

3.3. Separating the overall risk into wildfire and all other natural risks

22. The ratio of wildfire-driven forest losses to all disturbance-driven forest losses ($ratio_{WF}$) for the period 2001-2022 was calculated based on data from Acil et al. (2025). The reversal risk was then decomposed into “wildfire” and “all other” disturbances using equations (5) and (6).

$$\text{ReversalRisk}_{Wildfire} = ratio_{WF} \times \text{ReversalRisk} \quad \text{Equation (5)}$$

$$\text{ReversalRisk}_{AllOther} = (1 - ratio_{WF}) \times \text{ReversalRisk} \quad \text{Equation (6)}$$

Where:

$\text{ReversalRisk}_{Wildfire}$ = Reversal risk from wildfire (per centage)

$\text{ReversalRisk}_{AllOther}$ = Reversal risk from all other natural disturbances (per centage)

3.4. Aggregating grid-based estimates to broader geographies

23. 8-km grid-level reversal risk estimates were aggregated into sub-national, national, and multi-national units using the official boundaries from the Database of Global Administrative Areas (GADM). Aggregation was performed as a tree-cover-weighted average of grid-level reversal risks within each geographical unit. The nine disturbance severity scenarios are each combined with two climate scenarios (SSP2-4.5 and SSP5-8.5), yielding 18 scenarios in total. Disturbance severity scenarios are categorized as low, medium, and high for two forest categories: (1) tropical forests; and (2) temperate and boreal forests (Table 1).

Table 1. Nine disturbance severity scenarios used in the global analysis

Boreal and temperate forests (bt)	Tropical forests (tr)		
	38.5 per cent AGB lost (low)	71.6 per cent AGB lost (medium)	91.3 per cent AGB lost (high)
45 per cent AGB lost (low)	tr45bt385	tr45bt716	tr45bt913
55 per cent AGB lost (medium)	tr55bt385	tr55bt716	tr55bt913
65 per cent AGB lost (high)	tr65bt385	tr65bt716	tr65bt913

3.5. Discussion of reversal risk definition

24. As indicated above, this analysis defines reversals in two different ways:
- (a) When calculating reversals, the method identifies a reversal only when there is a net loss of at least 10 per cent of live biomass (or carbon) over a given period; and
 - (b) When projecting future reversals, the method projects only stand-clearing disturbances (i.e., only high-severity disturbance events).
25. Paragraph 20 of version 1.0 of the Reversals Standard defines a reversal as follows:
- (a) “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 .”
26. In general, the definitions used in this analysis and in the Reversals Standard are aligned. However, there are two differences that warrant consideration:
- (a) The historical component of this analysis uses a 10 per cent threshold, under which observed carbon loss events that reduce carbon stocks by less than 10 per cent are not considered “reversals” (i.e., when $0 > \Delta S_t > -0.1 \times S_{t-1}$). Because the Reversals Standard defines a reversal to include any loss of credited carbon, this methodological choice likely underestimates total reversals as that concept is defined in the Reversals Standard. The 10 per cent threshold was adopted to align with peer-reviewed methods designed for inventory-based data sources, which contain some uncertainty and noise in the primary source data that may not reflect actual carbon losses (Wu *et al.*, 2026a). In that context, the 10 per cent threshold was selected to increase accuracy and is maintained here for consistency; and
 - (b) The forward-looking component of this analysis considers only stand-clearing disturbance events, which lead to high-severity carbon losses. By design this approach does not include relatively low-severity disturbance events, which are expected to occur but are not included in the method or results presented here. Since the Reversals Standard defines a reversal to include any loss of credited carbon, this methodological choice likely underestimates total reversals as that concept is defined in the Reversals Standard. In the long run, high-severity disturbance events are likely to be the dominant driver of carbon stock changes, and thus the focus here is appropriate for analysing the most significant long-term

effects of natural reversal risks. However, less severe disturbance events would require carbon credits to be cancelled in the Reversal Risk Buffer Pool Account, even if in relatively smaller quantities than for the stand-clearing disturbances modelled here.

4. Results

27. Results are provided for two different variables:
- (a) Reversal risk from wildfire; and
 - (b) Reversal risk from all other natural risks, other than wildfire.
28. Total natural reversal risk is the sum of the two categories (i.e., wildfire reversal risk is assumed to be statistically independent from non-wildfire natural reversal risk).
29. Results are provided at the following geographical resolution levels:
- (a) Sub-national;
 - (b) National; and
 - (c) Multi-national.
30. Results are provided for 18 scenarios (nine disturbance severity scenarios x two climate scenarios) for each of three variables (total natural reversal risk, wildfire reversal risk, and all other natural reversal risk), reported at three spatial aggregation levels (sub-national, national, and multi-national).
31. For each result, the number in the output file represents the percentage of credited carbon that is projected to be lost to reversals from total natural risk, wildfire reversal risks, or all non-wildfire natural reversal risk, respectively, as calculated over a 100-year period.

Note: The definition of “country” used in this analysis follows GADM, under which a “country” is any entity with an ISO country code.

5. Recommendations from the technical consultant

5.1. Recommended scenario use

32. The three scenarios recommended for use in this methodological tool are tr55bt716 (medium-medium), tr45bt385 (low-low), and tr65bt913 (high-high), as shown in Table 1. All three scenarios are based on the SSP2-4.5 climate scenario. At this stage, the medium-medium scenario, tr55bt716, is recommended by the technical consultant for use in this methodological tool, as there is no clear reason to adopt the high-high scenario and no sufficient justification for selecting the low-low scenario. The natural reversal risk values based on the tr55bt716 disturbance scenario and the SSP2-4.5 climate scenario are presented in Appendix 1 of this methodological tool.
33. SSP2-4.5 represents a moderate-emissions pathway with climate projections that are broadly consistent with current policy commitments. Because disturbance severity remains poorly constrained by observations, these three scenarios provide a practical range of reversal risk estimates, spanning conservative lower-bound, central, and upper-bound assumptions. Based on the results of Wu *et al.* (2026b), reversal likelihoods

exhibited similar magnitudes and spatial patterns under the two climate scenarios, suggesting that uncertainty associated with disturbance severity is substantially greater than that associated with future climate projections. Therefore, the selected scenarios primarily represent a gradient of disturbance severities rather than climate scenarios.

34. Given their relative influence on the results, it may be more useful to place greater emphasis on uncertainty across the disturbance scenarios, while also acknowledging the role of climate scenario selection. Although the higher climate impact scenario can be expected to produce greater reversal risks for factors like wildfire, it also increases forest growth rates, such that these effects partially cancel one another out. As a result, the difference in projected reversal risk factors between the climate scenarios is much smaller than the difference in projected reversal risk factors across disturbance scenarios.

5.2. Application to clean cooking activities

35. Paragraph 6 of version 1.0 of the fNRB Tool defines the fraction of non-renewable biomass as follows:

“The proportion of harvested biomass that exceeds the natural rate of regeneration of the landscape during a given period.”

36. This term is used in carbon crediting methodologies to determine the number of carbon credits to be issued to clean cooking activities and other activities that reduce the consumption of non-renewable biomass.
37. Based on this understanding, it is appropriate to use the results of this analysis to quantify reversal risks associated with credited non-renewable biomass. Non-renewable biomass consumption would reduce forest carbon stocks over a given period, which is broadly aligned with the definition of a reversal used in this analysis. As discussed in section 3.5, however, the analytical approach described here is likely to underestimate reversal risks from natural disturbances.

5.3. Future updates

38. Although there is a substantial body of peer-reviewed literature documenting how to assess historical rates of forest carbon disturbance and how to project future disturbance rates and associated forest carbon losses, the literature combining these data and methods into an integrated approach is relatively newer. It is likely that this literature will continue to develop additional insights in the coming years, e.g., to better constrain uncertainties and improve the quantification of reversal risk assessment.
39. A reassessment every 2–3 years is recommended to incorporate advances in data availability, methodological approaches, and scientific knowledge in this rapidly evolving field.
40. It is also possible that updated estimates may be available sooner than 2–3 years, for example, to reduce the uncertainty associated with the scenario analysis or to improve the disturbance monitoring and approach. If a significant improvement were published earlier than 2–3 years from now and demonstrated a more accurate set of results, that could justify an earlier update.

41. Although there may be value in a more frequent update of these values to reflect the best available science that may emerge before the full 5-year period is done, 5 years is a reasonable maximum period for which to use any set of values.

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Appendix 3. Natural reversal risk factors considered under different climate and disturbance scenarios

1. Activity participant may use workbook available at <https://unfccc.int/documents/660517> for the natural risk factors under the different climate and disturbance scenarios.

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
02.0	17 September 2026	MEP 016, Annex 7. To be considered by the A6.4 Supervisory Body at SBM 023. This version takes into account the inputs received in response to the call for input on the draft document.
01.0	2 July 2026	MEP 014, Annex 07. A call for input on this document will be issued following the conclusion of the MEP 014 meeting. The input received will be considered by the MEP for the further development of this document at a future meeting.

Decision Class: Regulatory

Document Type: Tool

Business Function: Methodology

Keywords: A6.4 mechanism, methodologies, reversals, risk assessment
