<u>Supplement</u>

Glossary of terms, and guidance

Term	Scientific definition	Plain language explainer	Usage guidance / recommendation
High-impact climate possibilities (HICP)	Climate system behaviours whose probability is not easily quantified but whose impacts would have particularly severe consequences on regional to global scales.	These are large-scale (e.g., on a scale of continents) climate responses to certain conditions, where the likelihood is hard to quantify, but the consequences would be extremely severe if they occurred. They represent possible scenarios that are often not seen in models or observations, making their likelihood and timing difficult to assess. Examples include: • Extremely high levels of global warming (e.g., high climate sensitivity). • Geographically widespread high magnitude changes in rainfall patterns (e.g., high hydrological sensitivity). • Tipping points in the climate system, where changes become self-sustaining. Although impacts from these scenarios are not expected to occur in the near future (which could be from years, to decades depending on specific context), they may need to be considered in climate risk planning because of the scale and extreme severity of their potential impacts.	This term replaces '*high-impact, low-likelihood (HILL) events*' and '*low-likelihood, high-impact (LLHI) outcomes'*, which should not be used going forward. *"Possibilities"* better reflects that these are potential complex climate system scenarios, rather than discrete 'events' with a single, defined occurrence at a particular time and/or place. "*Low likelihood*" caused confusion: it was applied across a very broad set of outcomes, many of which had uncertain, unknown, or potentially higher likelihoods than the label implied. The term deliberately avoids reference to 'likelihood'. However, where scientific information on likelihood does exist, this should be clearly communicated, alongside confidence levels, for the specific HICP being described. Equally, where information on likelihood does not exist, this should also be communicated. This approach ensures that decision-makers receive the full set of relevant information, which can never be captured by an umbrella term. While it is preferable that each specific HICP is referred to individually, it is recognised that these types of responses are often, and will continue to be, grouped together under a single umbrella term, hence inclusion of the term here. Previous categorisations of the term have included scenarios arising from unexpected human actions, and compound extreme weather events. These have been deliberately excluded from HICP, either because of a more localised impact, or because of a focus here on the climate system rather than human forcing. It is recognised that in some contexts, it may be relevant to consider extreme forcing scenarios and extreme responses to the forcing together.

Term	Scientific definition	Plain language explainer	Usage guidance / recommendation
Earth system tipping element	A large-scale component of the Earth system that can shift to another state through self-reinforcing changes that become resistant to reversal.	A large part of the Earth system, such as an ice sheet, ocean current or forest system, that plays a role in how the wider Earth system works, that is vulnerable to changes which can start to drive themselves and become hard to stop. When this happens, the system is said to be close to or at a tipping point.	Further clarification has been provided here of the various terms that encompass the previously simplified, term ‘tipping point’. Inclusion of ‘Earth system’ enables a clear distinction between responses related to climate and ecological conditions and those that occur in socio-economic contexts. We encourage the use of ‘element’ when describing parts of the Earth system that are vulnerable to tipping, i.e., the AMOC, as the system itself is not a ‘tipping point’. The definitions are deliberately broad. Characteristics often associated with tipping behaviour, such as irreversibility, self-acceleration, or non-linearity, should be applied and defined for specific cases, and always accompanied by contextual information such as relevant timescales. *N.B. Use of the term ‘positive tipping point’ is discouraged. ‘Positive’ is often interpreted to mean something good (which isn’t always the case) and equally it could be considered as a reinforcing mechanism (i.e., feedback). To avoid confusion, we recommend specific explanations of shifts or changes that occur in these contexts be provided, or use of the terms ‘social tipping points’ or ‘socio-economic tipping points’ where appropriate.*
Earth system tipping point	A threshold within an Earth system component beyond which the system’s governing dynamics change, leading to a transition towards another state. This may be due to climate forcing or internal variability.	A threshold beyond which a part of the Earth system changes so much the change keeps going by itself. The real-world impacts of these changes may not be immediately observable and may evolve over very long time periods (varying from decades to centuries, or even longer), depending on the part of the Earth system involved.	
Earth system post-tip transition	Process by which a component of the Earth system moves to another state after crossing a tipping point.	This describes what happens after a tipping point is crossed. It is the process where a part of the Earth system changes enough that it begins to behave in another way.	

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Self-accelerating change (*Sometimes referred to as 'abrupt' change)*	When the system response accelerates due to self-reinforcing feedbacks, at a rate determined by its own internal dynamics rather than external forcing.	When a part of the Earth system begins to change faster because its own internal processes reinforce the change, rather than because external conditions are changing. In other words, once change is underway, the system itself starts to drive the pace of change. This does not mean the change happens instantly, but that it becomes faster than the system's usual rate of change.	This term replaces a*brupt change.* Evidence demonstrates that the implicit or everyday meaning of abrupt – something that happens instantly – is misleading in the context of climate. Where the term *abrupt* is believed to be necessary, **it is essential to specify the timescale** being referenced with respect to this change. This term refers only to self-reinforcing changes. Where changes in external forcing are contributing to the accelerated change, this should be explicitly outlined in the accompanying text.
Irreversible	A change is defined as irreversible on a given time scale if, after any causal forcing is removed, the recovery from this change due to natural processes takes substantially longer than the time scale of interest.	A change is called "irreversible" when it doesn't go back to how it was within a certain amount of time, such as decades or hundreds of years. It means that even if the cause of the change stops (e.g., human induced greenhouse gas emissions), the system may either recover very slowly or not at all. Due to the very long time periods over which these changes take place, other parts of the Earth system may also have changed and therefore the conditions may not return to how they truly were before the change took place.	The term *irreversible* must be qualified by timescale and context. On first mention, please consider and include reference to whether the use of the term refers to: **(a)** Geological (e.g., thousands, millions, billions of years) or human-life timescales (e.g., years, decades, centuries)? **(b)** The whole Earth system or dynamics of a specific Earth system component? Alternatively, consider using the term 'hard' or 'difficult to reverse' if irreversible does not quite fit. *N.B.* In everyday language, "irreversible" suggests permanence i.e., no going back, which may not align with scientific nuance. Even if a process is reversible over millennia, this distinction should be made clear for clarity of communication.

Term	Usage guidance / recommendations
Collapse & Shutdown	We recommend that these terms **not be used** in scientific, media or stakeholder communications, particularly in reference to physical changes affecting the climate system, including the Atlantic Meridional Overturning Circulation (AMOC) or any other tipping points that have previously used these terms such as ice sheets and forests. While the terms listed below offer an illustration of how potential, more descriptive language could be used, caution should also be applied when using terms that cannot be robustly scientifically defended. There are considerable differences in the way that terms such as "collapse" and "shutdown" are used within scientific literature, often without precise or robust definitions. These terms have implicit and everyday meanings that often do not align with the scenarios they have been applied to. They carry a misleading emotive value that is counterproductive to inspiring or leveraging action.

Here we provide an illustration of how terms can be unintentionally misused to describe concepts related to AMOC disruption. This list is non-exhaustive and further research is needed to identify the myriad ways "*collapse*" and "*shutdown*" are being used in the scientific literature. This is intended to emphasise the importance of clearly defining how terms are used in all literature, including scientific journals and the media to ensure implicit meanings are not unintentionally adopted.

AMOC disruption concept	Description	**How it might be referred in wider discourse** N.B. this is not an indication of how it *should* be used.
Major weakening / Loss of function	Large weakening of the AMOC that leads to a loss of its function (e.g. northward heat transport), but which could in principle be recoverable if forcing changed.	Collapse/collapsed state, shutdown, slowdown
Crossing tipping point	The condition in which the AMOC moves beyond a tipping point, even though some functionality may initially be retained.	Tipping point, collapse
Post-tip weakening	Process by which the AMOC experiences a large weakening, with a loss of functionality, after crossing a tipping point.	Collapse
Zero-strength AMOC	The AMOC weakens to zero strength leading to a loss of function.	Collapse, shutdown