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Practical guidance towards consistent use of overshoot terminology

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Practical guidance towards consistent use of overshoot
terminologyJoeri Rogelj^{1,2,3,*} , Anna Pirani⁴ , Andy Reisinger⁵  and Carl-Friedrich Schleussner^{3,6} ¹ Grantham Institute for Climate Change and the Environment, Imperial College London, London, United Kingdom² Centre for Environmental Policy, Imperial College London, London, United Kingdom³ Energy, Climate and Environment Program, International Institute for Applied Systems Analysis, Laxenburg, Austria⁴ Euro-Mediterranean Center on Climate Change (CMCC Foundation), Venice, Italy⁵ Institute for Climate, Energy and Disaster Solutions (ICEDS), Australian National University, Acton, Australian Capital Territory, Australia⁶ Integrative Research Institute on Transformations of Human-Environment Systems (IRI THESys) and the Geography Department, Humboldt-Universität zu Berlin, Berlin, Germany

* Author to whom any correspondence should be addressed.

E-mail: j.rogelj@imperial.ac.uk

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Supplementary material for this article is available [online](#)

Abstract

As global warming approaches 1.5 °C, the term ‘overshoot’ is becoming increasingly prominent in climate science, policy, and public communication, but the use of this term remains inconsistent and often ambiguous. This article traces the history of the term in ordinary language and science-policy contexts, showing how specialized uses such as ‘temperature overshoot’ or ‘overshoot pathway’ have diverged from the common meaning of exceeding a target or limit. We provide practical guidance for clearer communication, recommending that authors respect the ordinary meaning of overshoot and specify where insights refer to exceedance, peak warming, decline, or return below a given warming level, while avoiding short-hand terminology where it risks misunderstanding.

1. Context

The continued increase in global anthropogenic greenhouse gas emissions over the past decades means that global warming is approaching 1.5 °C and is expected to exceed it over the next decade if not in the next years (UNEP 2025, Forster *et al* 2026). While the pursuit of limiting warming to 1.5 °C remains central to the Paris Agreement and subsequent UN decisions (UNFCCC 2015, ICJ 2025, Rogelj and Rajamani 2025), the climate policy conversation must consider the reality of overshoot (Schleussner *et al* 2024, Reisinger *et al* 2025). Indeed, for the first time, the risk of exceeding 1.5 °C was acknowledged by a UN decision at COP30, reiterating its resolve to limit both the magnitude and overall duration of an overshoot (UNFCCC 2025). As a consequence, it is to be anticipated that the term overshoot will be used more frequently and more widely.

Over the past decades, overshoot has been used across diverse contexts, within the scientific literature

(Tavoni *et al* 2026), by the Intergovernmental Panel on Climate Change (IPCC) and several science synthesis reports by the UN Environment Program (e.g. (UNEP 2010, 2015)). However, differences between the ordinary meaning of the term overshoot (i.e. how it is defined in dictionaries and how people understand it in their daily lives) and the jargon use of the same term in parts of the scientific community have led to inconsistency and confusion around its meaning. Here, we aim to provide practical guidance on how overshoot terminology can be used in a way such that these issues can be avoided and that messages are clear, understandable, and consistently communicated across climate change research, science-policy engagement, and broad public communication.

The aim of this general guidance is to minimize confusion, align as much as possible with past practice, and maximize the clarity and impact of communication to non-academic audiences such as policy makers or practitioners going forward.

2. A long history

Use of the term overshoot is not new. In fact, it has been registered in the English language as early as the 1400s denoting the idea of traveling beyond or further than the intended destination (Oxford English Dictionary 2026a) or to miss a target by shooting a projectile with too much power or elevation (Oxford English Dictionary 2026b). With continued use since, the 1970s saw the term overshoot also being applied to electrical or other systems in the specific context of denoting the action or result of exceeding a limit or target (Oxford English Dictionary 2023). Overshoot has therefore a century-old meaning in the English language that persist in its modern use.

In science-policy, including in the context of IPCC and UNEP assessments, overshoot has been used in reports dating back to the Fourth Assessment (AR4) and preceding expert meetings, consistently referring to the exceedance of a target or limit (see figure 1). As its usage in science-policy literature aligned with the ordinary meaning as defined in English-language dictionaries, initially, no glossary definition was deemed necessary for overshoot. Over time, however, the IPCC and UNEP began to define short-hand terms that layered additional meanings onto overshoot such as ‘overshoot pathway’ or ‘temperature overshoot’ by incorporating the idea of both the initial exceedance but also of a subsequent return to a given level or limit (see figure 1, supplementary table 1). This created an incongruence between the term’s ordinary meaning and the interpretation expected in some scientific writing. As a result, a journalist who uses overshoot in its ordinary dictionary sense when reporting on climate could be seen, under these jargon definitions, as using the term incorrectly. An own goal for science communication. The paper next describes three recommendations to support clearer communication through a consistent use of terminology related to overshoot.

3. Guidance for communicating clearly on overshoot

1. Respect the ordinary meaning Given the deeply embedded common English meaning of the term overshoot, its application in science-policy contexts should aim to reflect its well-established meaning, as readers and listeners will understand it as referring simply and only to exceeding a level or limit. We suggest that it is unproductive to assert that overshoot has acquired a specialized inalterable meaning within the climate change mitigation literature to which all other users of the term must simply adapt. Overshoot, when used in isolation, should therefore maintain its ordinary meaning. This exceedance of a level or limit can refer to a concentration, temperature or other

variable, but is in the current climate debate almost exclusively used in relation to global warming levels. To minimize confusion, however, other unambiguous terms such as reaching, exceeding, crossing or surpassing should also be considered when referring to a transgression of a specific level of warming. That use of terminology can apply regardless of whether the transgression is permanent, might be temporary, or of an undefined nature: overshoot communicates the fact that a level has been transgressed, not whether the transgression may be limited in time.

For example, statements such as ‘temperature overshoot of 1.5 °C is very challenging to achieve’ make little sense to readers not familiar with the specialist overshoot jargon. Indeed, when read with only the well-established ordinary meaning of overshoot in mind, one might wonder where the difficulty lies in missing climate goals and crossing 1.5 °C of global warming. It is only through the lens of the specialist jargon (see figure 1) that the statement’s intention of subsequently returning global warming to a level of 1.5 °C can be inferred. Therefore, although the term ‘temperature overshoot’ appears in both IPCC and UNEP glossaries (see supplementary table 1), we discourage its jargon use and recommend to always respect the term’s ordinary meaning. Even when referring simply to the exceedance of a warming level, other terms would be preferred to avoid confusion with the existing glossary definitions.

2. Be specific and unambiguous Pathways that involve a period of overshoot can be segmented into four parts relative to a specified global warming level or other target: (i) crossing of the intended level of global warming, (ii) plateauing (and peaking), (iii) decline of global warming, and (iv) ultimate stabilization (see figure 2). The period between the moment of first exceedance and the subsequent return to below the intended level of global warming can be referred to as the exceedance or overshoot period. These various parts come with very different implications for both adaptation and mitigation (Schleussner *et al* 2024, Reisinger *et al* 2025). It is therefore recommended to avoid using abbreviated, short-hand expressions involving the term overshoot, or even overshoot pathway, is discouraged, as these almost indiscriminately confuse the reader about whether the statement is about the crossing of the intended temperature limit, the need and challenges of reversal, or a different aspect of pathways that peak and decline global warming.

For clarity and to eliminate ambiguity, it is recommended to explicitly specify which part of an overshoot pathway a discussion or assessment refers to (see table 1 for some examples in practice). For more general statements that refer to the entirety of a pathway, spelling out the relevant parts by using a formulation such as ‘overshoot, peak, and decline pathway’ is recommended.

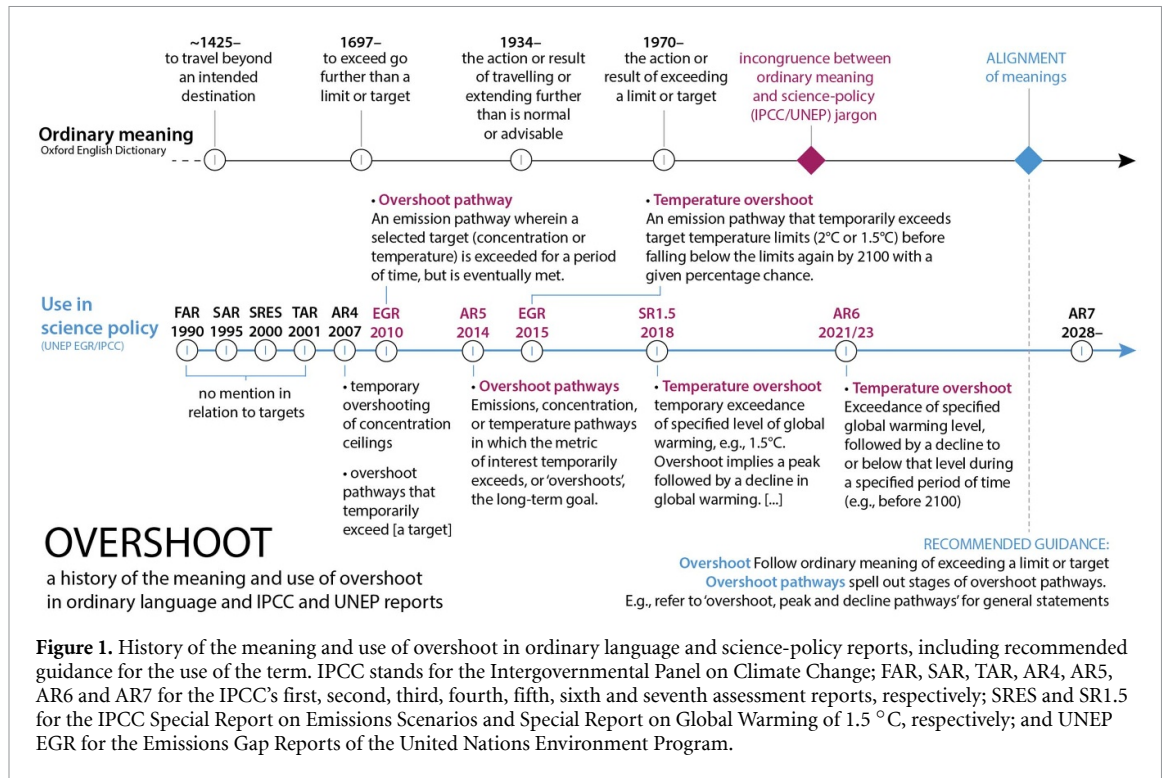
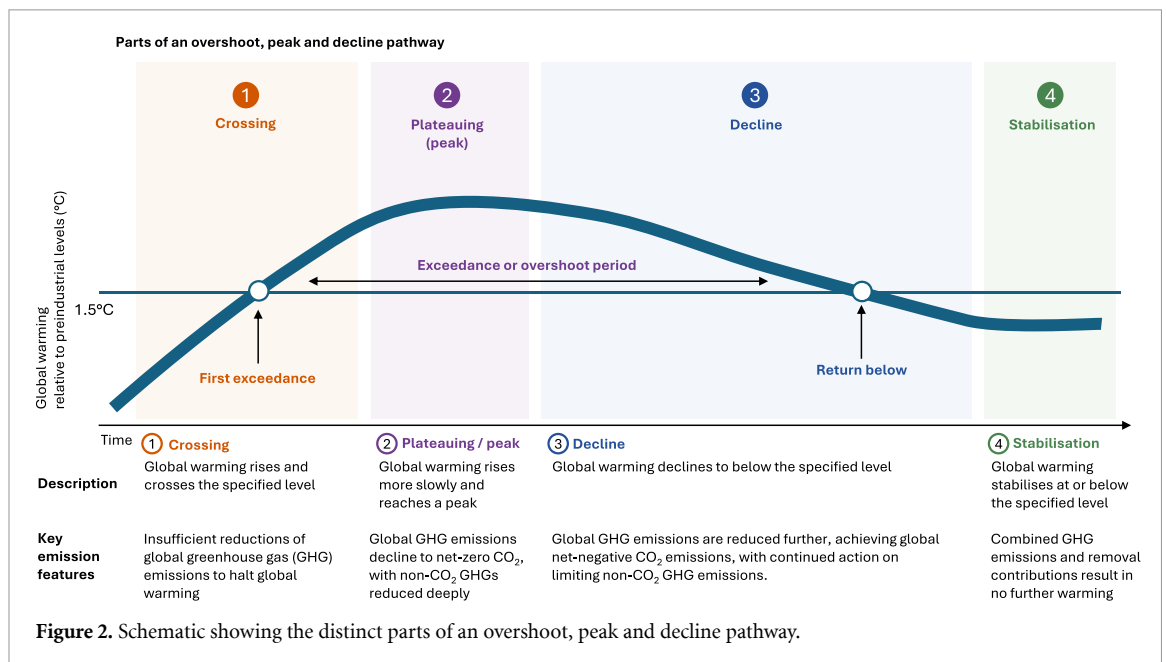


Figure 1. History of the meaning and use of overshoot in ordinary language and science-policy reports, including recommended guidance for the use of the term. IPCC stands for the Intergovernmental Panel on Climate Change; FAR, SAR, TAR, AR4, AR5, AR6 and AR7 for the IPCC’s first, second, third, fourth, fifth, sixth and seventh assessment reports, respectively; SRES and SR1.5 for the IPCC Special Report on Emissions Scenarios and Special Report on Global Warming of 1.5 °C, respectively; and UNEP EGR for the Emissions Gap Reports of the United Nations Environment Program.



3. Specify overshoot pathway characteristics The consequences of any overshoot, peak and decline pathway depend strongly on both the magnitude of peak warming and the duration for which warming exceeds the reference level. It is therefore recommended that overshoot pathways are introduced with a clear definition of both their peak warming level and the timing of return below the reference level. Such pathways can be well characterized by three parameters: e.g. the reference global warming level, the peak warming level, and the return time.

In previous IPCC practice and references to its insights in UNFCCC decisions (IPCC 2022b, UNFCCC 2025), overshoot and overshoot pathways refer to pathways in which global warming temporarily exceeds 1.5 °C, peaks below 2 °C above pre-industrial levels, and then returns below 1.5 °C before 2100. Therefore, if a 1.5 °C overshoot, peak, and decline pathway is mentioned without specifying how high warming peaks or when it returns below 1.5 °C, these default assumptions can be understood to apply. Even so, because of the large

Table 1. Paired examples of recommended (do's) and not recommended (don'ts) use of overshoot terminology.

OVERSHOOT	
DON'Ts	DO's
Do not say: 'Overshoot pathways rely on large-scale CDR during the second half of the 21st century'	Do say: 'Pathways that return global warming to 1.5 °C by 2100 after an overshoot rely on large-scale CDR during the second half of the 21st century'
Do not say: 'Overshoot pathways require accelerated mitigation in the near term'	Do say: 'Preserving the ability to return global warming to 1.5 °C after an overshoot requires accelerated mitigation in the near term to limit the magnitude of overshoot'
Do not say: 'Overshoot pathways require, at a minimum, achieving net-zero CO ₂ emissions'	Do say: 'Halting global warming requires, at a minimum, achieving net-zero CO ₂ emissions'
Do not say: 'Overshoot is the next best option for the world to limit climate-related risks'	Do say: 'Pathways that return global warming to below 1.5 °C after a period of limited overshoot are the next best option for the world to limit climate-related risks in both the near and long term'
Do not say: 'Overshoot has become an inevitable part of climate policy'	Do say (depending on a focus on adaptation, losses and damages, or mitigation) EITHER: 'Managing the consequences of global warming exceeding 1.5 °C for at least several decades has become an inevitable part of climate policy considerations' OR: 'Anticipating the need to achieve sustained net-negative GHG emissions has become an inevitable part of climate policy that seeks to "keep 1.5 °C alive"' OR: 'Dealing with the consequences of exceeding global warming of 1.5 °C and developing strategies to return back below that level has become an inevitable part of climate policy'
Do not say: 'Limiting overshoot depends on accelerated near-term mitigation'	Do say: 'Limiting the <i>magnitude</i> of overshoot depends on accelerated near-term mitigation, whereas limiting its <i>duration</i> also depends on the scale at which sustained global net-negative CO ₂ emissions can be achieved.'
Do not say: 'Pathways that limit global warming to 1.5 °C with high overshoot'	Do say: 'Pathways that return global warming to 1.5 °C [by END DATE/after temporarily exceeding that level]'
Do not say: 'Overshoot of 1.5 °C leads to irreversible climate risks'	Do say: 'Compared to stabilization at 1.5 °C, returning global warming back to 1.5 °C following an overshoot and decline pathway, will lead to an irreversible climate risk legacy'
CAN	BUT PREFER
You can say: 'All pathways consistent with recent global emission trends overshoot 1.5°C'	But preferably say: 'Under all pathways consistent with recent global emission trends global warming is projected to exceed 1.5°C'
You can say: 'Overshoot is now inevitable'	But it is clearer to say: 'Exceeding global warming of 1.5 °C is now inevitable'
TAKE CARE TO	
Do say: 'Overshoot, peak and decline pathways in this context are pathways that exceed global warming of 1.5 °C in the near term, peak and then return to or below that limit by 2100. All such overshoot pathways ...' (and use the short-hand 'overshoot pathways' within this and the next paragraphs; but for key conclusions that may be quoted in isolation, take care to bring the exceed-and-decline nature of those pathways back into the key finding).	

possible variation between them, pathways should be described as fully as possible. In particular, it should be made clear when warming peaks above 2 °C or does not return below 1.5 °C until after 2100, as these cases carry different implications and could otherwise be misunderstood.

The AR6 Glossary definition (IPCC 2022a) indicates that the term 'overshoot pathway' is under-specified when used without additional qualification and specification. The use of 'overshoot pathway', even if accompanied by a reference to the warming level being exceeded, should thus be understood as a short-hand that only makes sense if the full

meaning—i.e. a pathway that exceeds but then eventually is brought back to a given limit—has been spelled out to readers already. The level that is being overshoot for a period of time in overshoot pathways may be specified quantitatively (e.g. a defined global warming threshold) or qualitatively (e.g. the notion of stabilization without prior overshoot).

Derived uses of short-hand terms, such as the term 'overshoot pathway', are generally discouraged but could still be used in instances where the established IPCC definition—which describes these as '*pathways that first exceed a specified concentration, forcing or global warming level, and then return to*

or below that level again before the end of a specified period of time' (IPCC 2022a)—is clear to readers. However, if there is a possibility that parts of a text will be extensively quoted, or reused in separate policy or media contexts, the recommendation is to avoid short-hand altogether to support more accurate and clear communication.

4. Avoid using overshoot wildly In many cases 'overshoot' might not be the most relevant term to use. For instance, when the feature of peaking and declining global warming is central to the discussion rather than the specific threshold or limit relative to which this occurs, using more precise wording referring to a 'peak and decline [in global warming]' is preferred and recommended.

For example, expressions like 'overshoot pathways rely on large-scale carbon dioxide removal' are highly ambiguous and confusing for many readers; whereas 'achieving a decline in global temperature relies on effective large-scale carbon dioxide removal' are clear and specific to the relevant stage of an overshoot, peak and decline pathway. Table 1 provides examples that contrast recommended and not recommended use of overshoot terminology.


4. Outlook


Following these three guiding recommendations on the use of overshoot terminology can help strengthen the effectiveness of science-policy communication of a critical topic in global climate governance. Indeed, adopting this editorial discipline avoids the potential for confusion with the ordinary meaning of the word held by the general public, re-aligns with earlier usage in science and policy, and improves the general accuracy of language on overshoot allowing scientific assessment to communicate with clarity and precision.


Data availability statement


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Author contributions

Joeri Rogelj  0000-0003-2056-9061
Conceptualization (lead), Investigation (lead),
Visualization (lead), Writing – original draft (lead),
Writing – review & editing (equal)

Anna Pirani  0000-0001-7287-8347
Conceptualization (supporting),
Investigation (supporting), Writing – original
draft (supporting), Writing – review &
editing (equal)

Andy Reisinger  0000-0002-6631-7188
Conceptualization (supporting),
Investigation (supporting), Writing – original
draft (supporting), Writing – review &
editing (equal)

Carl-Friedrich Schleussner  0000-0001-8471-848X
Conceptualization (supporting),
Investigation (supporting), Writing – original
draft (supporting), Writing – review &
editing (equal)

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