THESIS

CONSTRUCTING STABILITY: IPPC'S CLIMATE DISCOURSE AND THE CHALLENGE OF FIXITY

Submitted by

David Martinez

Department of English

In partial fulfillment of the requirements

For the Degree of Master of Arts

Colorado State University

Fort Collins, Colorado

Spring 2025

Master's Committee:

Advisor: Erika Szymanski

Timothy Amidon
Eduardo Gallo-Cajiao

ABSTRACT

CONSTRUCTING STABILITY: IPPC'S CLIMATE DISCOURSE AND THE CHALLENGE OF FIXITY

As climate science circulates across scientific, policy, and public domains, its terminology must strike a delicate balance: stable enough to retain authority, yet flexible enough to be understood and acted upon in diverse contexts. This thesis examines how that tension plays out in the Intergovernmental Panel on Climate Change's Sixth Assessment Report (AR6)—a consensus document that synthesizes complex knowledge and makes it communicable across discourse spheres. Using Bruno Latour's concept of immutable mobiles, I analyze how the terms risk, vulnerability, and adaptation are circulated and framed across three AR6 enactments. Through qualitative coding and critical discourse analysis, I trace how these terms shift rhetorically across different sections and uses. The findings show that even when definitions are fixed institutionally, key terms shift in response to political and rhetorical demands. This study calls for a reconfiguration of the tools we use to stabilize knowledge: immutable mobiles should be more narrowly defined, and glossaries must evolve into dynamic, source-linked frameworks that account for context and audience. By identifying where stability fractures and proposing new models for definitional accountability, this research offers a revised understanding of how terminology operates in scientific consensus reports—moving beyond the illusion of immutability toward a more adaptive and transparent model of climate communication.

TABLE OF CONTENTS

Introduction

Every five to ten years since 1990, the Intergovernmental Panel on Climate Change (IPCC) releases one of the most comprehensive reports on our understanding of the current state of the climate crisis. These reports—known as Assessment Reports—collate and synthesize research across nations, disciplines, and ways of knowing, offering a consensus-driven foundation for understanding the crisis's trajectory. The Sixth Assessment Report (AR6), published in 2023, provides the most thorough and up-to-date curation of research regarding the current state of climate change progression. It encompasses predictions of mass extinctions, species and ecosystem displacement, and extreme resource scarcity, addressing not only what we may face but also what we can do to slow the progression of the crisis (68, 71). The report emphasizes our role as humans in creating adaptive strategies and assesses and communicates existing risks; it recognizes the inequities and exclusions that climate change creates and those that it reinforces. The findings, grounded in extensive climate modeling, shape the way we understand the crisis and how to prepare for it.

But how do we define and communicate threats at this scale? How do scientific bodies, tasked with synthesizing and conveying complex and uncertain realities, create language that is both precise and actionable? And how does the act of stabilizing knowledge—of setting definitions, establishing risks, and outlining adaptation strategies—reshape the very crisis it seeks to describe?

These questions are not being asked to dispute or contest the scientific knowledge that is contained and synthesized in these reports; rather, they are instead foundational to how scientific knowledge is communicated, trusted, and acted upon. Scientific bodies like the IPCC work to stabilize knowledge in the face of complexity, yet the act of stabilizing knowledge is itself a

rhetorical process. What gets defined, how risks are framed, and whose adaptation strategies are prioritized all shape the way we understand and respond to the crisis. As a rhetorician, I turn to these moments of definition and framing, not to question their validity, but to examine how their construction enables or constrains action. If people cannot make sense of the IPCC's research—if they can't integrate or act upon it— then it risks leaving communities less prepared for extreme hazards, limiting the impact of adaptation efforts, and contributing to the ongoing endangerment of vulnerable populations. This tension between the need for certainty and the inevitability of change is not unique to climate science but is deeply embedded in scientific discourse more broadly.

Scientific research is often framed as a pursuit of order—a means of distilling the complexity of the world into stable, verifiable ground from which we can observe. Scholars of science and technology studies (STS) work to interrogate how we communicate what affordances these stable grounds offer and how they were constructed to begin with. These truths, once articulated, form the foundation upon which policies are built, decisions are made, and futures are shaped. Yet, this pursuit is never as simple as it seems. The stability we seek in science is always contingent. The ground from which we observe is rarely as firm as we imagine. Knowledge shifts as new data emerges, disciplines evolve, and methods change. Even the words we use to describe scientific phenomena are not fixed. Definitions—presumed to provide clarity—exist in flux and are always and everywhere shaped by social, political, and disciplinary forces. The people who are mobilizing and communicating information can redefine and shape interpretation with tools like glossaries and footnotes; the receiver of the message individually interprets how these words make meaning. This tension between contingent knowledge and the

demand for stability becomes particularly visible in high-stakes and fraught discourses such as those navigated by the IPCC.

This challenge of achieving scientific knowledge that maintains structure across contexts is especially visible in high-stakes and contentious discourses (e.g. in climate studies), where the need for certainty collides with the ever-shifting nature of knowledge production and communication (Funtowicz and Ravetz). While the IPCC must present climate knowledge as stable, actionable, and capable of mobilization, the knowledge it synthesizes is interpreted and reshaped in every enactment and movement; it is made fluid through competing methodologies, disciplinary priorities, political constraints, and the localized contexts it is received in. Through a rhetorical lens, this raises questions surrounding the tension between high-stakes communication that demands stability and the reception of this knowledge that demands plasticity. It is these questions that this study stems from—examining how the IPCC negotiates this tension and what it reveals about the limits of scientific stability in high-stakes discourse.

Though this research examines climate discourse and its communication, my interest in these questions originally stemmed from a broader exploration of how knowledge moves across disciplines and discourses. I became particularly fascinated by the tension between stability and instability in this movement—how concepts remain recognizable even as they are transformed or translated across knowledge spheres and localized contexts. Across disciplines, I encountered stabilization tools designed to manage this tension: isomorphic structures in mathematics (Hofstadter), immutable mobiles in STS (Latour, Visualization and Cognition), and ideographs in rhetorical studies (McGee), to name a few.

Yet, despite the prevalence of these stabilizing frameworks, I kept encountering discussions of unpredictability—moments where knowledge resisted containment, and certainty

gave way to flux. Chaos theory, entropy, and post-normal science each exemplify how disciplines theorize the limits of predictability: Lorenz's work in mathematics reveals the sensitivity of systems to initial conditions; entropy in physics models the inevitable drift toward disorder; Funtowicz and Ravetz's theory of post-normal science in STS accounts for the complexity and uncertainty inherent in urgent, high-stakes decision-making. These frameworks complicated my understanding of stability. No longer was it a fixed property, but something negotiated, fragile, and constantly at risk of unraveling.

My interest in interdisciplinarity and the connective threads across academic fields intersect with my commitment to climate studies and environmentalism. Climate discourse offers a uniquely rich site for examining how knowledge is made to appear stable, even when that stability is tenuous. Unlike traditional scientific publications, climate policy documents are often tasked with navigating a collision between epistemic complexity and rhetorical clarity: they must make room for uncertainty while presenting it as actionable. In doing so, they reveal how scientific knowledge is selectively communicated depending on audience, application, and urgency. They are tasked with making science usable across audiences—anticipating how it will be received by publics and policymakers, and projecting consensus even when disagreement or ambiguity remains. This demand makes climate discourse a particularly compelling lens for analyzing how knowledge is simplified and made (un)stable as it circulates. It is here, at the intersection of communication, urgency, and institutional authority, that the tension between stability and instability in climate knowledge becomes visible and unavoidable.

Because climate knowledge is communicated across such varied actors and discourse spaces, it becomes essential to examine how that knowledge is stabilized as it moves. The Intergovernmental Panel on Climate Change (IPCC) provides a particularly useful site for this

analysis—not because it generates new climate science, but because it is tasked with collating and synthesizing existing research for global interpretation and use. Formed as a joint body of the United Nations Environment Programme and the World Meteorological Organization, the IPCC now includes 195 member governments and serves as one of the most authoritative institutions in global climate discourse. ("About the IPCC"). Its role is not to adjudicate the truth of climate science, but to make it actionable: to assemble, condense, and translate complex, sometimes contradictory findings into statements that can guide international policy and shape public understanding. In this way, the IPCC sits at the nexus of scientific consensus and rhetorical mobilization. It is where scientific information is not only interpreted, but also granted institutional legitimacy and communicative force. Because of this function, the IPCC offers a generative location for examining how stability is constructed and contested within global environmental discourse.

These dynamics, including the compression of complex scientific findings into communicable and consensus-driven forms, raise foundational questions about how the IPCC constructs stability and frames meaning in its key terms. The culmination of these theories and STS-based concerns—(in)stability, stabilizing tools, unpredictability, knowledge mobilization, and the scale of the climate crisis—led me to the central research questions guiding this analysis: How does the IPCC attempt to construct stability and impose immutability in its definitions of key climate terms as they are mobilized throughout AR6? How do those terms shift in meaning as they are enacted across the Synthesis Report, Summary for Policymakers (SPM), and Headline Statements?

Beyond analyzing how these disciplinary concerns get enacted in climate discourse, these research questions allow me to investigate how the audience's individual contexts and situated

knowledges breed instability. By analyzing the movement and evolution of terminology across AR6 enactments specifically, this thesis explores a type of instability that emerges from the power dynamics between writer and reader, and between locations of power and how that affects communities that the research speaks into. The IPCC works to construct stable, immutable meaning through its glossary, refined footnotes, and the body text itself. Yet, these very measures create openings for interpretive fluidity, revealing that immutability is never fully achieved but negotiated at every enactment of these high-stakes terms.

To investigate the tension between stability and instability, particularly the relationship between fixed terminology and its reinterpretation by different audiences, I turned to Bruno Latour's immutable mobiles (IMs). Given the need for a framework that assumes stability as a baseline, I required an analytical tool with firm boundaries, one that resists mutation as it is (re)enacted across different AR6 assemblages and adapted for distinct audiences. Because this study investigates how instability manifests in contentious and emerging scientific discourses, it is essential to begin with a tool that explicitly advertises stability as its defining feature; without establishing an assumed stability at the outset, my research questions lose both their feasibility and urgency. Other stabilizing frameworks—such as network topologies (Mol and Law) and boundary objects (Star and Griesemer)—account for fluidity as an inherent feature, stabilizing knowledge while allowing for contextual reinterpretation. In contrast, IMs frame stability as a totalizing and transportable feature, making them ideal for examining the limits of immutability in high-stakes, highly mobile knowledge spheres. By using IMs as the dominant framework for this study, I identify moments where "perfect stability" is advertised and trace where and how these boundaries begin to break down.

With this framework established, the following chapters examine how these concepts manifest in practice. First, the literature review contextualizes immutable mobiles by tracing their evolution from Latour's original theorization to their reconceptualization across disciplines. It then explores alternative stabilizing tools in STS before shifting to a discussion of three key terms—risk, vulnerability, and adaptations.

The methods and methodology chapter outlines how this study was conducted, detailing my position as a scholar working within STS, using post-normal science as a framework, and analyzing stability through Latour's lens. This research employs an iterative constant comparative coding process and critical discourse analysis to locate key terminology in context and to examine definitional (in)stability across AR6 enactments.

The analysis chapter first establishes how the IPCC defines its high-stakes terminology within the glossary, then traces how these meanings shift as the terms are mobilized across AR6 enactments. This process reveals two key findings: first, that immutable mobiles must be reconceived and further boundaried to remain analytically useful; and second, that definitional spaces such as glossaries must acknowledge instability as an inherent feature of language rather than resisting it. Finally, the conclusion reflects on the broader implications of these findings, asking: if perfect immutability cannot be achieved, how can scientific language be structured to accommodate multiple interpretations while maintaining precision? And what does this necessary fluidity reveal about the role of language in shaping scientific knowledge?

Finally, this thesis considers the broader implications of these findings. As terms are mobilized across AR6 assemblages, their fluidity becomes undeniable—not only in the definitions that attempt to bind them but also in the interpretations that emerge within different contexts. When scientific knowledge is disseminated at large scales, the language used alters

how it is received, what actions can be justified, and how risks are understood. Whether these shifts stem from temporal, physical, or social differences in interpretation, the result remains the same: any attempt to define a term rigidly only holds within the specific conditions under which that definition was created. I argue that this instability is not unique to climate discourse. It has profound implications for other high-stakes, globally coordinated efforts—such as public health responses, environmental policy, and international governance—where scientific findings must be communicated across disciplines, political landscapes, and cultural contexts. This research, then, is not only about the IPCC, but the broader limitations of scientific stability and the ways knowledge must be negotiated as it moves through complex, interdisciplinary, and international spaces.

Literature Review:

This research examines how (in)stability manifests in the process of defining and employing terminology. Scientific knowledge is often treated—particularly in policymaking and public discourse—as unilaterally true and transportable, though scholars have long problematized this assumption. Drawing on Bruno Latour's concept of Immutable Mobiles (IMs), this chapter first examines how IMs are theorized as tools for stabilizing knowledge and how they function in contested interdisciplinary discourse spaces like the Intergovernmental Panel on Climate Change's (IPCC) Sixth Assessment Report (AR6). Further, this chapter explores how IMs have been critiqued and adapted throughout the literature and how different disciplines envision and employ them. In addition to IMs, the literature has also examined other stabilizing tools—such as boundary objects and network topologies—each of which offers alternative perspectives on how to describe the structure and maintenance of knowledge across discourse spaces.

Finally, this chapter explores the role of terms such as risk, vulnerability, and adaptation in climate discourse. While the methods and methodology chapter will explain how these three terms became central to this study, this section examines how they have been theorized and applied. Situated at the intersection of science and technology studies (STS) and technical/environmental communication, I highlight the challenges these terms pose for communicating climate knowledge effectively as they get mobilized across social contexts and disciplines. Whether they are made fluid because of their temporal framing, localized reinterpretations, or the social conversations they are enmeshed in, these three terms serve as locations for examining how this definitional instability mutates their reception and actionability as they are utilized across AR6 enactments.

Theories on Immutable Mobiles

To understand how immutable mobiles function in knowledge-making practices, it is first necessary to turn to the scholar who coined the term—Bruno Latour. In his theorization, he examines how scientists attempt to construct stability in knowledge-sharing spaces by creating objects that can:

> …withstand the return trip without withering away… the 'things' you gathered and displaced have to be presentable all at once to those you want to convince and who did not go there. In sum, you have to invent objects which have the properties of being mobile but also *immutable*, *presentable*, *readable* and *combinable* with one another. (Visualization and Cognition 7)

His seminal work in *Science in Action* the following year adds to our understanding of the affordances that an immutable frame offers: "Copernicus' books, plus many versions of Ptolemy's *Almagest*… generates what I will call immutable and combinable mobiles. All these charts, tables and trajectories are conveniently at hand and combinable at will, no matter whether they are twenty centuries old or a day old" (227). In short, Latour offers IMs as a vehicle or combined package that can effectively translate, mobilize, and condense information into a singular and immutable thing. Most often, IMs are collections of observations and representations—such as maps, charts, and datasets—that stabilize knowledge by indicating where and how these objects exist physically or contextually. However, Latour acknowledges that this stabilization is always partial: in their attempt to be mobile and combinable, IMs inevitably condense, omit, and selectively represent data (*Pandora's Hope* 28-29).

Latour's work suggests that IMs function as vehicles for knowledge translation and mobilization by creating the perception of stability; they are designed to be superposed upon each other and "reshuffled, recombined, and summarized" (Visualization and Cognition 30). IMs

must remain "combinable" and preserved across translations (Peverini 25), allowing new knowledge to be created as they are layered atop each other. Yet, as both Latour and later scholars note, this process is never entirely seamless. IMs, though attempting to create the perception of a highly stable and broadly recombinable object, are easily evolved and mutated when they are superposed and delocalized. Latour recognized that they are simplified—they condense and omit information to achieve stabilization, but the contexts they are received in can alter their ultimate functionality; they shift interpretatively and physically when the viewer or location changes (Bennett, "Mutable Immutable Mobiles"). Although IMs are designed to be stable and unchanging, both movement and interpretation inevitably reshape their meaning and capabilities. Scholars have built upon this, further challenging the idea that knowledge can ever truly remain immutable when mobilized across disciplines and audiences.

Although Latour offers some challenges to his own conceptions of immutability in Pandora's Hope, various scholars engage with and critique the level of stability that IMs are intended to offer. While IMs are useful in these spaces because of their perceived ability to stabilize and package knowledge for mobilization, movement often introduces mutability and fluidity, regardless of the objects' perceived static nature. This instability is described differently across disciplines and discourses. In scholarship on museums and archives, scholars such as Tony Bennett agree that moving artifacts spatially and categorically not only mutates them but turns them into "mutable immobiles." They no longer are in movement but change consistently based on their new physical, temporal, and conceptual locations.

While Latour's framework remains influential in STS, scholars continue to debate the extent to which IMs actually preserve stability in contested discourse spaces. Research in museum studies, archival studies, and interdisciplinary scientific collaborations has demonstrated

that movement itself introduces interpretive fluidity. Climate discourse, particularly in documents like AR6, relies on terminological stability to maintain credibility and support global policy recommendations. Yet, as this study will demonstrate, key climate terms such as risk, vulnerability, and adaptation do not function as truly immutable mobiles—despite their institutional framing. By applying the concept of IMs to climate discourse, this research examines how stability is rhetorically constructed and where it breaks down, revealing the tensions between knowledge mobility and the need for scientific authority in public-facing climate reports.

Alternative Theories on Stabilizing Tools

While IMs provide one model of stabilization, other frameworks—such as network topologies and boundary objects—offer alternative perspectives on how knowledge maintains coherence across contexts. Examining these alternative models highlights how different scholars conceptualize stabilization as relational and contextual.

Primarily, I'm interested in exploring the fluidity that is built into every other stabilizing tool and how they acknowledge these inherent fluctuations without compromising the stability of a concept or object. Unlike Latour's IMs, which were originally presented as capable of maintaining a version of stability across contexts, other stabilizing tools acknowledge and account for fluidity; rather than claiming this larger-level immutability, they stabilize specific aspects of an object or concept within particular contexts. Whether exploring Mol and Law's network topologies or Star and Griesemer's boundary objects, it becomes clear that scholars who theorize on stability focus on stabilizing particular dimensions of an object rather than asserting its immutability.

Understanding how these tools operate as stabilizing mechanisms provides the necessary foundation for differentiating them from IMs. Starting first with Mol and Law's concept of the

network topology, we recognize many aspects of it that operate similarly to IMs—in that they help create stability in the interpretation and analysis of an object. Network topologies are categorized by stability in "which distance is a function of the relations between the elements and difference a matter of relational variety" ("Regions, Networks, and Fluids" 643). Though Mol and Law's article articulates networks as relationally dependent rather than intrinsically stable, they nonetheless describe how networks function to hold objects in place by maintaining structured connections between entities. In this sense, network topologies resemble IMs in that they allow knowledge to circulate while preserving recognizable markers of stability. As opposed to regional topologies that act as "immutable immobiles" and fluid topologies that act as "mutable mobiles" (Gonçalves and Figueiredo), the network topology acts as a knowledge space that allows for stabilized interpretation based on local contexts.

This brings us to boundary objects, a concept developed by Star and Griesemer, which offers another approach to stabilization as objects get moved between spaces and discourses. While network topologies operate through relational stability, boundary objects function as shared reference points that enable collaboration across disciplines and epistemic communities. Similar to IMs, boundary objects allow knowledge to be transferred across different contexts while maintaining enough coherence to be recognized. However, unlike IMs, boundary objects are inherently flexible and take on different meanings in different social worlds.

As originally theorized, boundary objects are conceptual or tangible objects that can be mobilized across various discourses and spaces without losing their recognizability. Star and Griesemer assert that these boundary objects must be:

> …plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites. They are

> weakly structured in common use, and become strongly structured in individual-site use… they have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation. (393)

Boundary objects, then, act as stabilizing tools not by enforcing a single, immutable meaning but by maintaining a common immutable structure that different communities can interpret and analyze differently for their purposes. Each group that engages with the boundary object can work with it in a way that makes sense for their own disciplinary or social context while still allowing for shared understanding across fields. Unlike IMs, which are meant to theoretically resist interpretive shifts across assemblages, boundary objects derive their effectiveness from this structured fluidity.

While boundary objects and network topologies offer valuable insights into how knowledge is stabilized across disciplines, they do so by explicitly acknowledging and accommodating interpretive flexibility. These frameworks assume that stability emerges relationally, adapting to the needs of different social and epistemic communities. However, less attention has been paid to stabilization frameworks that function not through structured flexibility but through an imposed perception of fixity. Climate discourse, particularly in documents like AR6, relies on a model of stability that appears to resist interpretive shifts in order to maintain credibility and authority. This raises questions about whether climate terminology, once mobilized across different discourse spaces, can ever truly function as an immutable mobile or whether movement inevitably fractures its meaning. This study extends existing research by applying IMs to climate terminology, interrogating how terms like risk,

vulnerability, and adaptation operate as both stable reference points and contested rhetorical tools in high-stakes scientific discourse.

Situating These Conversations

Because IMs and other stabilizing tools function within broader knowledge production systems, it is useful to turn to Science and Technology Studies (STS) to further examine how knowledge is stabilized and mobilized across disciplines and institutional contexts. However, stabilization is not solely a theoretical concern—it also shapes how terminology is structured and communicated for different audiences. To investigate this, this study draws from STS, technical and environmental communication, and the framework of post-normal science (PNS). Together, these perspectives offer a layered approach to understanding how key climate terms are stabilized, adapted, and contested in the IPCC's AR6.

Disciplinary Grounding

Science and Technology Studies (STS) provides a foundational framework for understanding how scientific discourse is constructed, stabilized, and mobilized across social, political, and academic spaces. As a discipline, STS emphasizes the social process of knowledge creation in the sciences and interrogates how social forces—as well as the inherent messiness of scientific methods—contribute to instability in how knowledge is communicated and mobilized (Law, Making a Mess). John Law, in particular, critiques the assumption that scientific methods produce neat, orderly knowledge, arguing that traditional approaches often obscure the complexities and contradictions inherent in scientific research. This recognition is central to discussions of how the IPCC navigates the tension between stability and fluidity in climate discourse.

STS offers two primary insights relevant to this study: first, that scientific knowledge is never universal but always shaped by the localized contexts of its production; second, that

scientific methods themselves are not neutral but construct and reinforce particular epistemological and political frameworks. Donna Haraway's "Situated Knowledges" critiques the notion of scientific objectivity, arguing that dominant knowledge structures reinforce a "God trick"—an all-seeing authority that privileges hegemonic perspectives while marginalizing alternative epistemologies (581). Instead, Haraway argues for a "Feminist Objectivity," where knowledge is understood as partial, situated, and contingent. This perspective is particularly relevant to climate discourse, where scientific findings must simultaneously maintain authority while being responsive to diverse global contexts.

STS often grounds its research in case studies of scientific experimentation, while simultaneously interrogating the actors, structures, and power dynamics that shape these processes. Because it is concerned with both scientific claims and the methods that produce them, its scholars critically examine how research practices structure knowledge, reinforce power relations, and shape the realities they claim to describe. Law articulates this as a focus on:

> …the tactics and strategies of practices, to methods, and to how these stage the world… [how] they generate different realities and normativities; that the relations between these are uncertain; and that much STS is currently struggling in one way or another to generate methods that recognize, properly attend to, or stage better ways of handling difference. ("STS as Method" 48-49)

While STS has long interrogated how knowledge is socially produced, less attention has been given to how stabilization frameworks function in high-stakes, policy-driven scientific communication. Climate discourse, particularly in documents like AR6, does not merely describe scientific realities—it constructs them through terminology that must retain stability while moving across audiences and political contexts. While STS has long interrogated how

knowledge is socially produced, fewer studies have examined how stabilization frameworks function in high-stakes, policy-driven scientific communication where stability is not just emergent, but often strategically imposed. By applying STS insights to the study of IPCC terminology, this research investigates where stability is imposed, where it fractures, and what this reveals about the mobilization of scientific knowledge in public discourse.

While this thesis is primarily grounded in science and technology studies, scholars in environmental and technical communication have also explored how terminology shapes meaning across audiences, institutions, and rhetorical contexts. Technical communication, for instance, often emphasizes clarity and usability, analyzing how language is structured to guide action and shape understanding (Markel and Selber). Environmental communication extends this attention to how institutional language can marginalize alternative epistemologies and reinforce dominant narratives about the climate crisis (Milstein et al.). While I do not attempt to speak directly from within these fields, their insights inform the broader stakes of this study—particularly the challenges of making scientific language both stable and actionable across multiple audiences. As the following section on post-normal science will explore, these challenges intensify in moments of scientific uncertainty and public controversy, where definitions must carry both authority and flexibility.

In addition to insights from environmental and technical communication, this project also intersects with global environmental policy conversations. While not engaging that field directly, it shares overlapping concerns—particularly around how language informs climate action, mediates authority, and shapes policy decisions. Scholars in global environmental governance often examine how institutional structures and international agreements coordinate cooperation and manage trust across regions. For instance, the Earth System Governance Project outlines the

challenges of governing across scales and offers frameworks for understanding how legitimacy, accountability, and participation are negotiated (Biermann et al.). Although such work focuses more squarely on political infrastructures and policy mechanisms, it is animated by similar questions: How is complex scientific information communicated? How is authority constructed? And how are terms stabilized for uptake across diverse contexts? Rather than intervening in that literature directly, this thesis complements its concerns by examining the rhetorical mechanics that underlie such processes—especially how language itself becomes a tool for mobilizing knowledge and negotiating authority in public-facing scientific discourse.

Post-Normal Science

Post-normal science (PNS) emerges from the recognition that scientific knowledge is always shaped by its context. Like other STS theories, it acknowledges that methods and methodologies must be understood as situated and contingent rather than universally stable. Coined by STS scholars Silvio Funtowicz and Jerome Ravetz, PNS has been expanded and debated by scholars across STS, such as Donna Haraway and Andrea Saltelli.

At its core, PNS is frequently summarized as the study of scientific research processes where "facts are uncertain, values in dispute, stakes high and decisions urgent" (Funtowicz and Ravetz 744; Saltelli 945). As scientific challenges grow in scale and complexity, traditional methods of discovery and communication struggle to function. Knowledge production becomes increasingly diffuse, making it difficult to maintain both local relevance and scientific authority in policymaking. Rather than seeking to stabilize knowledge in the traditional sense, Funtowicz and Ravetz argue that high-stakes scientific discourses require new approaches to decision-making that can accommodate uncertainty. In these contexts, they advocate for extended peer communities, in which expertise is expanded beyond traditional scientific elites to include stakeholders, policymakers, and affected communities. These broader knowledge networks help

navigate complexity, not by producing a single, authoritative truth, but by allowing multiple forms of knowledge to contribute to decision-making. However, while Funtowicz and Ravetz position PNS as a necessary response to complexity, the framework is not without critique.

Haraway, for instance, critiques PNS for its tendency to concentrate epistemic authority in exclusive communities, often privileging dominant voices while claiming to expand participation. While PNS emphasizes the inclusion of diverse perspectives through extended peer communities, Haraway warns that without careful attention to power asymmetries, these groups can simply reproduce existing hierarchies rather than dismantling them. Extending her metaphor of the "God Trick," PNS seeks to strip power away from a singular God who asserts truth; however, Haraway's argument highlights that PNS creates a new pantheon instead of effectively and equally disseminating power among those involved in the discourse. While more people participate in the creation of truth, it is often still disseminated among those in power rather than those who are vulnerable and affected.

Beyond concerns about power, Saltelli raises another major issue: by emphasizing uncertainty and competing knowledges, PNS can inadvertently provide a framework for challenging well-established scientific consensus. When knowledge is labeled or critiqued as contingent and unstable, well-supported scientific findings risk being placed on equal footing with politically motivated misinformation. This tension is particularly evident in climate discourse, where actors with vested interests have leveraged uncertainty not to improve decision-making, but to obstruct it: "it is almost a rule that the best intentions inevitably lend themselves to distortion and manipulations… The fathers of PNS were presciently aware of this risk—and of the danger that PNS could be perverted before its full innovative potential could come to be realized" (Saltelli 951). While PNS is a theory that is meant to destabilize power structures

surrounding claims to "truth," it risks legitimate scientific discovery being disparaged and spoken over. As Saltelli warns, frameworks like PNS can be invoked in bad faith to distort facts rather than meaningfully engage with uncertainty.

While PNS has been widely applied to discussions of scientific uncertainty and decision-making, less attention has been given to how this framework operates in the stabilization of scientific terminology. Climate discourse, particularly in documents like AR6, faces a paradox: it must acknowledge uncertainty while maintaining credibility and authority. This raises questions about whether climate terminology can remain stable as it moves between scientific, policy, and public discourse spaces. By applying PNS to climate terminology, this study examines how the IPCC negotiates stability and uncertainty, revealing how key climate terms function as both authoritative reference points and sites of rhetorical contestation.

Because PNS highlights the challenges of knowledge production under uncertainty, it is also necessary to examine how this knowledge is communicated and framed for different audiences. This requires turning to technical and environmental communication, where scholars have analyzed how terminology shapes meaning, action, and public engagement in climate discourse.

Risk, Vulnerability, Adaptations

Given the centrality of terminology in scientific communication, it is necessary to examine how scholars across disciplines have conceptualized and analyzed the mobilization of key climate terms. Risk, vulnerability, and adaptation emerge in climate discourse as particularly unstable categories—which will be explored in the following chapter—inviting scrutiny in how they are defined, applied, and interpreted. As some of the most dynamic and expansive terms that were coded for during this research, these three terms were chosen because of the instability in their definitional boundaries, which makes them perfect for examining stability in AR6. I am

most interested in examining the different rhetorical implications of these terms and what aspect of their use makes them have such a high propensity for mutability.

For risk, it is primarily described as unstable in the literature because of the embodied and localized strategies that risk perception and management demand. The term can't be employed equally across space, time, and epistemologies because every community, region, network, or discipline observes the risks and interprets them uniquely. This is reflected in the work of scholars such as Simmons and Grabill, as well as Cana Uluak Itchuaqiyaq, who highlight the need for risk to be situated in specific and localized contexts. Similarly, Ribot et al. and Alyson Cole emphasize the social and political forces that create instability in how we determine who and where the label "vulnerable" is ascribed. Finally, Pflugfelder argues that adaptability is dependent on the evaluation of Kairos—the opportune moment for action—and the temporality surrounding that assessment. Because different actors may interpret the timing and urgency of adaptation efforts differently, instability emerges in deciding when and how adaptations should be implemented. It is these different assessments of instability in the enactment of terms that make them valuable in assessing instability as a concept, and it is these discussions which will help analyze how those mutations occur throughout AR6.

Risk

To understand how risk will be analyzed in this research, it is essential to first recognize why risk perception and management must be situated. Risk cannot be meaningfully extracted from the spatial and epistemological contexts in which it is interpreted and acted upon. When risk is framed at a global or national level, it often fails to account for the localized knowledge and lived experiences that shape community-level decision-making.

First, risk becomes destabilized when it is assessed without consideration for localized understandings of present conditions. A gap emerges between those quantifying risk at a broad

scale and those experiencing it firsthand. This discrepancy not only skews assessments but also hinders the development of effective mitigation strategies. Moreover, when risk is labeled externally without the involvement of those directly affected, communities lose agency in shaping their own adaptive responses. As Simmons and Grabill argue, "If citizens cannot access, assemble, and analyze the information they find, they will not be able to produce the necessary knowledge to participate in decision-making processes that affect their lives" (432). In short, the further removed risk assessments are from the communities they concern, the less actionable and relevant they become. When applied wholesale to entire nations, economic categories (e.g., "developing" vs. "developed" nations), ecosystems, or broad demographic groups, risk loses its specificity and utility, making it difficult to translate into meaningful action; when risk becomes delocalized and applied as a broad label to describe a vague exposure to hazards, it loses the stabilization that a high-stakes term like that demands.

Risk becomes even more unstable when viewed as a construct shaped by different modes of knowing and recognizing the potential and presence of risk. Large-scale, transnational risk assessments often obscure or override the locally situated ways in which communities understand and mitigate risk. While this disconnect can be observed across many knowledge traditions, it is particularly pronounced in Indigenous epistemologies, where climate knowledge is deeply embedded in lived experience and relational ways of knowing. Cana Uluak Itchuaqiyaq's chapter *"*When the Sound Is Frozen: Extracting Climate Data from Inuit Narratives*"* highlights how Inuit communities assess climate risks through methods that are fundamentally different from Western scientific approaches, yet no less rigorous or essential:

> Thus, narrative methodologies require equitable local partnerships at a leadership level in the data collection, in the data analysis processes, and in the research design itself. Inuit

> partnerships enrich research regarding climate change in Arctic landscapes as well as inform climate action to protect those landscapes. (35)

When risk is assessed through large-scale frameworks detached from local ways of knowing, it loses its capacity to meaningfully inform adaptive strategies at the community level. Inuit knowledge, for example, is embedded in direct engagement with ice, weather, and animal behaviors—forms of expertise that cannot be translated into Western models without significant loss of meaning. This raises a critical question for AR6: not only must we interrogate the scale at which risk assessments operate, but we must also ask whether these assessments acknowledge and integrate the specific, situated ways in which communities understand and navigate risk. Given this instability in the concept of risk, it is necessary to examine how the IPCC's AR6 navigates these tensions between scale, epistemology, and knowledge mobilization.

Vulnerability

Whereas risk becomes destabilized when removed from local contexts, vulnerability is destabilized by its claim to objectivity despite being deeply embedded in political, social, and cultural power structures. Vulnerability is not an inherent condition but a designation applied by some and imposed upon others, often reinforcing hierarchies of power in the process. Labeling a group as vulnerable is not a neutral act; it asserts dominance, often obscuring the structural inequalities that produce vulnerability in the first place. By framing vulnerability as a universal condition that can be applied wholesale to a region, nation, or ecosystem, such classifications exacerbate and reify existing power differentials (Cole).

This instability is further underscored by the fact that those labeled as vulnerable are often placed in conditions that heighten their exposure to harm—not as a result of inherent weakness, but due to political and economic forces that shape their access to resources, mobility, and protection:

> Vulnerability is shaped by ongoing political-economic processes of extraction, accumulation, social differentiation and marginalization, within a given set of property relations (ownership and access) shaped by relations among various groupings within society ([e.g.] class, caste, or professional groups). These relations are mediated by state policies (such as development policies, social security policies, and patterns of enforcement). (Ribot, et al. 120)

Vulnerability, then, is neither an objective category nor a passive state—it is an active construction that reflects the priorities of those defining it. The very act of labeling introduces instability, as the labeler makes choices about which risks, populations, and conditions are recognized while rendering others invisible. The term cannot be applied universally because it is always embedded in specific contexts, shaped by infinite intersecting factors that must be evaluated by those experiencing them in situ.

Adaptations

Finally, this brings us then to the term adaptations and the unique ways in which it invites discussions on instability. Where the section on risk is about localized and situated ways of knowing and recognizing the risks and the section on vulnerability speaks to power differentials in its application, adaptations become destabilized in the face of temporality. When climate researchers neglect to speak to or analyze the timing behind implementing and managing climate adaptation and mitigation strategies, the term loses rigid application potential. This is described by scholars such as Ehren Helmut Pflugfelder in his book *Geoengineering, Persuasion, and the Climate Crisis*.

To make sense of how timing and temporality destabilize the application and use of adaptations, we must understand what the rhetorical term Kairos is doing. As described by John Smith for *The Monis*, Kairos is "the special position an event or action occupies in a series…

[something] that can not happen at 'any' time, but only at 'that time'… The question especially relevant to Kairos time is 'when?', 'At what time?'… the 'right time'" (1). Said another way, Kairos represents a moment in time when something must be/should be done. Rhetorically, it emphasizes that there is a "perfect" moment when a certain thing should occur to be most effective and applicable, and that infinite factors help us gauge or recognize when that kairotic moment is.

Kairos and temporality then are critical to analyzing the term adaptation, because knowing when an adaptation should be implemented or when it may lose applicability is the central question to actualizing climate mitigation strategies. Without these conversations surrounding when to implement or when to scale back an adaptation strategy, the term becomes a blanket statement; it recognizes various strategies and their limitations but fails to define when they might be plausible. Pflugfelder emphasizes why this kairotic approach to adaptations matters:

> For [certain climate scientists], the kairotic moment for [carbon dioxide removal (CDR)] could be now, perhaps thirty years ago, and the sooner functional CDR technologies come online the better. On the other hand, [Solar Radiation Management (SRM)] technologies… might be seen as emergency measures that we should at have the ready. (17)

Pflugfelder then goes on to argue that Kairos isn't dictated by only one group. For instance, conservative think tanks that do not believe that human greenhouse gas emissions are causing climate change might recognize adaptations and their timing differently: "the right timing for the deployment of SRM technologies [for them] is unlike that which is manifest for climate scientists" (17). It is from this view of timing that we begin to see where instability might be

bred when the term is invoked. If we are to discuss climate adaptation strategies without then speaking to when they should occur, there is no clear concept of what these strategies are capable of. Without knowing when an adaptation limit may be reached or when the effectiveness might be at its peak, adaptation becomes a term that can be applied vaguely and that mutates in various contexts.

Taken together, these theoretical frameworks illustrate the complexities of stabilizing knowledge in high-stakes climate discourse. While Latour's IMs provide a useful framework for understanding how knowledge is designed to remain stable, critiques from STS, tech comm, and environmental communication demonstrate that mobility itself generates unavoidable instability. Risk, vulnerability, and adaptation, though positioned as stable within AR6, shift meaning as they are mobilized across different contexts. Examining how these terms function in practice provides insight into how scientific authority is negotiated and how knowledge must continually adapt while retaining credibility.

To systematically analyze these definitional shifts, this study employs a structured methodological framework that combines qualitative coding with critical discourse analysis. The following chapter details this approach, outlining the data collection, coding schema, and analytical techniques used to examine terminological stability within AR6.

Methods and Methodology

Having established how scholars have theorized stability, knowledge mobilization, and climate terminology, this chapter turns to the methodological framework that guides this study's approach. This study applies a methodological framework that assumes stability as a baseline, allowing for a direct analysis of where and how it functions in AR6 terminology and where it ultimately breaks down. To do so, this study applies Science and Technology Studies (STS), post-normal science (PNS), and Latour's immutable mobiles (IMs) as its foundation, providing a lens through which to examine how knowledge is structured, stabilized, and adapted within high-stakes climate discourse. This section justifies these theoretical choices, outlining how they provide the necessary tools for investigating how terminology functions as both an epistemic anchor and a site of rhetorical contestation in climate reports.

Building on this theoretical foundation, this study employs qualitative coding and critical discourse analysis (CDA) to systematically identify and analyze the movement of key climate terms across AR6. Through an iterative coding process, terms were categorized based on their frequency, contextual use, and definitional stability, ultimately isolating risk, vulnerability, and adaptation as key sites of terminological (in)stability. Once these terms were identified, CDA was applied to examine how they were rhetorically constructed, stabilized, and mobilized across AR6 enactments. The following section outlines the data selection process, coding criteria, and steps taken to narrow the scope of analysis, as well as how CDA was employed to assess the discursive strategies used to reinforce or challenge terminological stability.

Methodology

Why Immutable Mobiles?

Because this study investigates how stability is constructed, maintained, and challenged in climate discourse, it required a theoretical framework that assumes stability as a baseline

rather than treating it as an emergent or negotiable property. While multiple frameworks exist for studying knowledge transfer—including boundary objects and network topologies—these models inherently accommodate interpretive flexibility, making them less effective for analyzing how stability is imposed, reinforced, or fractures when knowledge is mobilized. Unlike these alternative frameworks, immutable mobiles (IMs) were selected as the primary analytic tool because they assume knowledge can be stabilized and transported without alteration. This assumption allows for a more direct analysis of where and how stability functions in AR6 terminology and where it ultimately breaks down.

Unlike boundary objects, which allow for interpretive flexibility across audiences, IMs are designed to retain structure and resist contextual shifts, making them particularly relevant for analyzing how the IPCC attempts to construct and maintain definitional authority in AR6. Boundary objects, as Star notes, are inherently adaptable, evolving as they are interpreted within different contexts: "They are worked on by local groups who maintain [their] vaguer identity as a common object, while making [them] more specific, more tailored to local use within a social world" (Star, "This is Not a Boundary Object" 604-605). This flexibility allows boundary objects to function as interdisciplinary tools, but it also introduces limitations when applied at the level of individual terminology. Star herself acknowledges this, explaining that while words could function as boundary objects, they operate most effectively at the organizational level rather than the granular level of terminological analysis (612). Because this study focuses specifically on how individual climate terms are stabilized and mobilized across AR6 enactments, boundary objects do not provide the necessary level of fixity for this analysis.

Similarly, network topologies emphasize relational stability rather than fixed reference points, making them less suited for studying individual terms in AR6. Mol and Law describe

networks as knowledge structures where stability is not inherent but emerges from interactions with other topological formations ("Regions, Networks, and Fluids" 643). A network topology does not exist as a self-contained system but must be reconciled with regional and fluid topologies, meaning that stability is always negotiated rather than imposed. Because network topologies assume that objects remain in flux, they are less effective for studying whether terminology retains its intended stability as it moves across contexts. By contrast, IMs provide a framework that assumes stability is fixed and maintained, allowing this study to critically assess where this assumption holds and where it fails. However, because terminology itself is not traditionally treated as an immutable mobile, this study extends their application to linguistic structures, treating key climate terms as epistemic objects designed to function as fixed reference points in scientific and policy discourse.

Coding and Critical Discourse Analysis

Because this study investigates stability at the level of individual terminology, a research method was needed that could systematically identify and track key climate terms across AR6. Following this line of thinking, I chose an iterative qualitative coding process because it allows for granular-level analysis, enabling me to isolate the most rhetorically volatile terms, assess their frequency, and examine their surrounding contexts.

Through an iterative coding process, this study identified terms that appeared frequently but exhibited contextual variation in how they were enacted. By categorizing terms based on their stability, policy relevance, and adaptability across different AR6 enactments, coding made it possible to systematically pinpoint where linguistic volatility occurred. This process ultimately refined the analysis to three focal terms—risk, vulnerability, and adaptation—which emerged as the most significant sites of terminological (in)stability in AR6.

Once key terms were identified through coding, a deeper analysis was required to examine how these terms functioned within AR6's discourse. To assess how risk, vulnerability, and adaptation were positioned within broader institutional and political frameworks, this study employed CDA. Because the IPCC's reports must balance scientific authority with policy influence, terminology is shaped by broader institutional and social forces. CDA was chosen because it highlights how language establishes credibility, negotiates meaning, and reflects underlying power structures. This approach ensures that key terms are not only defined explicitly but also examined in relation to the rhetorical and institutional forces that shape their use. This study follows Van Dijk's approach to CDA, which focuses on how discourse constructs legitimacy and influences public understanding. By analyzing both definitional clarity and rhetorical framing, CDA reveals how risk, vulnerability, and adaptation function as stable reference points while adjusting to different scientific and policy contexts. This method moves beyond identifying key terms to explore how language shapes authority and reinforces or challenges dominant narratives within AR6.

Methods

Coding Boundaries

To maintain analytical precision and prevent artificial inflation of coded terms, this study established strict boundaries for what textual elements would be included in the coding process. Since AR6 is a multi-layered document with footnotes, figures, headings, and multimedia components, these parameters ensured that only substantive instances of terminology use were analyzed.

Titles (subsections, figures, etc.) were excluded from coding to prevent inflated frequency counts. Certain sections of AR6 are explicitly structured around key terms—such as "risk," "mitigation," and "sustainable"—but these instances serve as organizational markers

rather than sites of rhetorical construction. For example, many subsection titles in Section Three of the synthesis report contain the word “adaptation,” yet these references do not engage with its meaning, application, or complexity. By omitting titles, this study focuses solely on instances where terms are actively used in context rather than passively listed as structural signposts. Additionally, organizational names, legal documents, and climate-centered events were excluded, as they reference fixed entities rather than contributing to the evolving rhetorical function of key terms.

Footnotes were selectively coded depending on their function. AR6 footnotes serve two main purposes: some introduce new discussions or extend key claims, while others simply redefine terminology. Definitional footnotes—such as footnote 86, which redefines “effective” in relation to adaptation measures (55)—were excluded to avoid artificially inflating term frequency. Including these references would have led to a recursive coding process, analyzing fluid terms within stabilized definitions. However, footnotes that extended discussions or provided additional evidence were included, as they contribute to how terminology is mobilized across AR6.

Multimedia (figures, images, and descriptions) were excluded to maintain focus on textual enactments of terminology. While visual elements in AR6 reinforce the report’s discourse, including them would have introduced inconsistencies in analysis and overrepresented key terms already present in the body text. Many figures are accompanied by extended descriptions that reiterate terminology found in the main document, further inflating frequency counts. Since the synthesis report also references external multimedia publications, this study set firm boundaries around the three core documents under review, ensuring a consistent analytical scope.

Coding Process

Guided through concepts offered by Danny Saldaña in his book *The Coding Guide for Qualitative Researchers*, the coding process proceeded in three iterative phases, designed to refine and isolate key terminology across AR6. Given the scale and density of the documents this process required multiple rounds of refinement to systematically identify volatile terms, track their contextual shifts, and narrow the dataset to a focused set of core terms for analysis.

The first phase, initial coding, involved a close reading of AR6, the Summary for Policymakers (SPM), and the Headline Statements (HS) without preconceived categories. This phase aimed to systematically break down the text, identifying high-frequency terminology and examining moments where key terms were either stabilized or contested. Through this process, terms were categorized based on their definitional role, rhetorical function, and presence across multiple AR6 enactments. The initial phase yielded over 100 distinct codes, forming the working list carried into the second phase.

The second phase, axial coding, refined and reorganized the dataset. This process eliminated synonyms, consolidated overlapping codes, and emphasized terms with the highest rhetorical weight. This phase helped me eliminate synonyms, reorganize my data, and emphasize only the most representative and dominant codes (Boeije 109). To maintain consistency, I developed a heuristic which helped guide the selection surrounding which terms would remain:

- Does this term have a morphological variant already present in the codebook (e.g. adapt, adaptation, adapting)?
- Does this term have little to no effect on the rhetorical messaging located in that AR6 enactment?
- Would this term be perceived as a term with common enough definitions that miscommunication would be unlikely?

Terms that met any of these criteria were merged or removed, reducing the dataset to approximately 40 terms.

The final phase structured the codebook around three overarching categories, allowing for a focused analysis of high-stakes concepts. While all 40 terms identified were rhetorically volatile, certain terms carried greater definitional weight due to their relational function. Rather than coding for an expansive network of interconnected terms, I selected terms that acted as central anchors within AR6's discourse. Risk, vulnerability, and adaptation stood out as the most rhetorically significant, shaping how the IPCC negotiates stability in AR6. Their selection marked the conclusion of the coding process and laid the groundwork for the study's critical discourse analysis.

Coding Schema

While the previous section outlined the iterative coding process, this section details how coding categories evolved throughout analysis. With each major phase of coding, categories were merged, reframed, or removed entirely to isolate the terms most relevant for answering the research questions.

During the initial coding phase, three major term categories emerged: IPCC Terms, General Terms, and Hybrid Terms. To ensure consistency, these categories were defined by strict criteria. IPCC Terms were explicitly defined in the "Annex One Glossary" published alongside the synthesis report. Not all glossary terms were coded, as some (e.g., "albedo," "carbon dioxide") lacked the volatility necessary to reveal instability in climate discourse. Instead, IPCC Terms consisted of terms with high potential for fluidity across AR6 enactments, including "disaster," "mitigation," and "climate governance."

General Terms were identified as high-stakes but were not defined within the IPCC glossary. These terms carried significant rhetorical weight but lacked an authoritative definition within AR6, making them more susceptible to interpretive shifts. For instance, the word "urgent" conveys immediacy, but its meaning varies across disciplines and audiences.

Hybrid Terms initially emerged as a separate category but were later reabsorbed into the existing schema. These terms—often hyphenated or paired concepts such as "just-transition" and "effective adaptations"—blurred categorical boundaries. At first, they seemed distinct due to their ability to shift meaning depending on their context. However, as coding progressed, maintaining them as a separate category proved redundant, as each could be classified under either IPCC or General Terms based on its dominant function in AR6.

The axial coding phase refined these categories further by consolidating redundant terms and reducing complexity. Hybrid Terms were incorporated into either IPCC Terms or General Terms, eliminating unnecessary overlap. Additionally, the list of coded terms was significantly narrowed, focusing only on terms demonstrating both high frequency and meaningful rhetorical variability. Given AR6's discursive complexity, nearly any term could be analyzed for (in)stability, making it necessary to emphasize those that shifted most significantly across enactments. This phase eliminated over 60 terms from the codebook, reducing the dataset to 40 high-impact terms.

To further refine the dataset, the final phase of coding structured the codebook around three overarching conceptual anchors. This triadic approach, as inspired by Saldaña's "Study's Trinity" (344), ensured a focused and substantive analysis of the coded terminology. Rather than coding for an expansive network of interconnected terms, I selected terms that functioned as core

rhetorical anchors in AR6. This final phase identified risk, vulnerability, and adaptation as the focal points for analysis.

Emphasizing IPCC Terms allowed for the most direct analysis of how seemingly stable terminology becomes fluid through mobilization. While all 40 coded terms exhibited rhetorical volatility, risk, vulnerability, and adaptation provided the clearest sites for interrogating (in)stability in high-stakes climate discourse. These terms serve as conceptual anchors in AR6, shaping discussions of climate impact, policy, and mitigation, making them ideal focal points for critical discourse analysis.

To move beyond identifying key terms and into a deeper analysis of their rhetorical function, this study employed critical discourse analysis. Having established risk, vulnerability, and adaptation as the most rhetorically volatile terms, CDA provided the tools necessary to examine how these terms were defined, framed, and mobilized across different sections of AR6.

Critical Discourse Analysis

After isolating my three primary terms of analysis, I applied critical discourse analysis (CDA) to examine how they functioned across AR6 enactments. CDA investigates how language constructs meaning within specific social, political, and institutional contexts, making it well-suited for analyzing how risk, vulnerability, and adaptation are framed within high-stakes climate discourse. In his article "Principles of Critical Discourse Analysis" van Dijk explains that CDA is particularly concerned with how discourse structures and reinforces power dynamics, shaping public understanding and institutional legitimacy (249-50). Because these terms carry significant rhetorical and political power, CDA allowed me to assess not only how they were defined but how their meaning shifted across different audiences and contexts.

In applying CDA to my analysis, I focused on how risk, vulnerability, and adaptations were framed across AR6, the SPM, and HS documents. While my coding process identified

these terms as particularly volatile, CDA allowed me to analyze how their meaning was shaped not only by textual context but also by the institutional and political forces behind the IPCC. I examined where these terms were explicitly defined—such as in glossary entries and footnotes—and analyzed how they were enacted in context, assessing whether their usage aligned with or deviated from the interpretative frame provided by the IPCC.

Ultimately, CDA led me to focus on three dominant power structures and social constructions that undergird my three terms: risk is entrenched in the power dynamics of globalized scientific research that ignores the localized and situated ways of knowing and mitigating risk; vulnerability is a term that is used as a label by and for those in power toward the end of enforcing it over other groups; adaptations is entrenched in temporal power issues that insist on certain actions being down on timeframes that dominant groups dictate. Additionally, I attended to how each term functioned across different sections of the reports, noting whether they were framed in ways that reinforced the interpretive framing that the IPCC offered, or conversely, highlighted a shift in the terms' definition. These shifts often correspond to the different audiences of AR6—policymakers, scientists, and the general public—raising questions about how the IPCC balances technical precision with strategic ambiguity to maintain credibility and drive action.

The following analysis chapter traces these discursive shifts in depth, examining how risk, vulnerability, and adaptation function within AR6. By analyzing where these terms reinforce stability, where they introduce ambiguity, and where their meanings fracture, this study illustrates some of the ways in which the IPCC negotiates (in)stability in climate discourse. Through this examination, I highlight the broader implications of how knowledge is stabilized and mobilized in scientific reports intended for diverse audiences.

Analysis:

With our three terms of study isolated and methodological frameworks established, this chapter returns to the guiding research question: How does the IPCC attempt to construct stability and impose immutability in its definitions of key climate terms as they are mobilized throughout AR6? How do those terms shift in meaning as they are enacted across the Synthesis Report, Summary for Policymakers (SPM), and Headline Statements? While the IPCC constructs a perception of stability through definition and boundary setting, this stability is contingent and context-dependent. Even terms that appear fixed in the glossary must bend to local contexts and climate variables if they are to be effective at conveying the intended message.

Given that immutability of terminology relies on definitional stability, this section begins by analyzing the glossary as the IPCC's most explicit attempt to establish meaning. With the glossary and occasional footnotes asserting claims of definitional and interpretive stability, it becomes critical to understanding how the IPCC frames stability and, further, the power dynamics and social contexts that underlie these linguistic choices. However, the glossary does not exist in isolation; its terms are mobilized and enacted throughout AR6's reports. To examine how this stability holds up in practice, I analyze instances where these terms are invoked in the Synthesis Report, Summary for Policymakers (SPM), and Headline Statements (HS), attending to how shifts in rhetorical, political, and temporal contexts reshape their meaning and function.

Using immutable mobiles (IMs) as a framework, this analysis evaluates whether the glossary functions as an immutable reference point or whether meaning inevitably shifts as terms are mobilized across different AR6 enactments. While Latour conceptualized IMs as stabilizing knowledge across contexts, I argue that terminology resists this level of immutability. As these terms circulate through different documents, their meaning is strategically adapted to fit shifting institutional, political, and social needs. These shifts in meaning challenge the idea that scientific

terminology can remain fixed when employed in transnational and contentious discourse spaces. Ultimately, this analysis leads to the discussion of two primary assertions: IMs need to be constrained and further boundaried to be useful in post-normal science contexts. Likewise, definitional spaces such as glossaries should move away from absolute language that falsely promises stability, instead adopting a framework that accounts for the inevitable flexibility of terms in practice.

Definitional Work

Before examining how IMs (de)stabilize when mobilized across AR6 assemblages, it is first necessary to recognize that the terms identified during coding are already multiplicitous. The IPCC explicitly states that the "Annex I Glossary" is intended to "define some specific terms as the Lead Authors intend them to be interpreted in the context of this report" (AR6 803). In doing so, the glossary attempts to construct immutable definitions; it frames these terms as fixed, stable, and universally applicable across the report. Yet, as this section will demonstrate, even within the glossary, the illusion of stability begins to unravel. Focusing on three volatile terms—risk, vulnerability, and adaptations—I analyze how they are boundaried in definition, what these definitions reveal about the (in)stability of scientific terminology, and how this instability is amplified as they are enacted throughout AR6.

Risk

The term risk exemplifies the tension between stability and flexibility in IPCC discourse. While the glossary presents it as a fixed and definable concept, it simultaneously embeds multiple dimensions of uncertainty. Unlike most glossary terms, which receive a singular definition (or at most, a singular variation), risk is given five distinct entries, with the base definition being among the longest across the entire glossary. This definition is layered with other volatile terms—such as vulnerability, exposure, hazards, and impacts—demonstrating that

risk is not an isolated concept but a relational one; the term is shaped by shifting conditions and our interpretations of the other dynamic terminology included in its definition.

The glossary frames risk as a dynamic interaction between "climate-related hazards" and the exposure and vulnerability of affected systems. Moreover, risk is linked to uncertainty, arising from "implementation, effectiveness or outcomes of climate policy, climate-related investments, technology development or adoption, and system transitions." This definition highlights an inherent contradiction: while the glossary attempts to stabilize risk through explicit definition, it simultaneously concedes that its meaning is contingent on context and the current state of the situation. Though risk functions as an IM because of the hard boundaries the IPCC has established for the term, and its capacity to be layered and superposed with other IMS, its interpretation is necessarily dependent on external factors, shifting in response to policy decisions, local environmental conditions, and socio-political structures.

This fluidity is further emphasized by the glossary's inclusion of four additional risk variations*:* risk assessment, risk management, risk perception, and risk trade-off. Each of these terms attempts to provide structure to risk but ultimately reinforces its instability. Risk perception, for example, is defined as "the subjective judgment that people make about the characteristics and severity of a risk" (AR6 821). This suggests that risk is inherently shaped by audience positionality—scientists, policymakers, and the public may interpret the same climate event with vastly different levels of perceived urgency. This aligns with post-normal science's claim that in high-stakes, uncertain situations, facts are not purely objective but negotiated through social, political, and epistemic standpoints (Funtowicz & Ravetz).

By contrast, risk assessment attempts to construct risk as an empirical category, defining it as "the qualitative and/or quantitative scientific estimation of risks." This definition places risk

within an evidence-based framework yet remains dependent on external variables: who is conducting the assessment, what metrics are being used, and how the results are interpreted. Similarly, risk management introduces another layer of contingency, defining itself as "plans, actions, strategies or policies to reduce the likelihood and/or magnitude of adverse potential consequences, based on assessed or perceived risks." Though framed as a proactive tool, risk management is an inherently speculative practice—its success is contingent on unknown future conditions.

Taken together, these variations demonstrate that risk cannot be fully stabilized, even within the glossary's rigid definitional structure. Each attempt to boundary risk as a scientific category is undermined by the term's dependency on context, audience, and shifting political conditions. As a result, risk exemplifies the tension at the heart of climate discourse: the need for stable terminology that can guide policy and action, set against the reality that these terms must remain adaptable to remain useful.

Vulnerability

The term vulnerability initially appears less complex than risk—because of its singular entry in the glossary—yet it similarly grapples with the challenge of creating stable meaning. The IPCC defines vulnerability as "the propensity or predisposition to be adversely affected," further explaining that it "encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt. See also Exposure, Hazard, and Risk" (AR6 826). At first glance, this definition appears to provide stability by listing specific components and framing. However, the glossary's reliance on interconnected terms such as risk, exposure, and hazard reveals that vulnerability is not a fixed condition but a relational construct. Its meaning is dependent on the interplay of other volatile terms, making it resistant to complete stabilization.

Like risk, vulnerability should act as IM, appearing as a stable and transportable concept that is superposed and combined with others to create stable knowledge. However, what is revealed through its definitions is that this stability is achieved through abstraction: the definition itself is vague, gesturing toward specificity while remaining flexible enough to be applied across diverse contexts. This aligns with post-normal science's claim that uncertainty must be navigated through adaptive knowledge structures, rather than rigid definitions (Funtowicz & Ravetz). The glossary itself signals this instability by acknowledging that vulnerability "encompasses a variety of concepts," yet it provides little tangible guidance on what it means to have a "propensity" for harm. Without clear boundaries, the term remains open to interpretation, allowing different AR6 enactments and working groups to apply it in varying ways.

Beyond this definitional fluidity, vulnerability's meaning is further destabilized by its entanglement with other volatile terms. The glossary directs readers to exposure, hazard, and risk, reinforcing that vulnerability cannot be assessed in isolation. Without engaging in risk perception, risk assessment, and risk management, there is no tangible way to determine who is vulnerable and to what extent. This interdependence suggests that vulnerability is not an inherent characteristic but a contextually assigned status, dependent on local variables, disciplinary priorities, and social frameworks.

Critically, this framing raises questions about who has the authority to define vulnerability and how this categorization influences climate discourse. By positioning vulnerability as a condition to be assessed—rather than as an active negotiation of risk and resilience—the glossary reinforces a top-down perspective. Vulnerability is something determined by institutions, rather than something actively navigated by affected populations. This mirrors broader critiques in environmental communication, where institutional framings

often obscure agency and reduce vulnerable communities to passive recipients of aid or policy intervention (Milstein et al.). In effect, while vulnerability is presented as a stable, transportable term, its meaning is continuously shaped by the priorities of those defining it.

Adaptations

Among the three terms examined, adaptation appears at first to be the most clearly defined and self-contained. Unlike risk and vulnerability, its glossary definition does not directly reference other volatile IPCC Terms. However, this initial clarity is deceptive. The definition immediately introduces a distinction between human systems and natural systems: "In human systems, [it is] the process of adjustment to actual or expected climate and its effects… in natural systems, the process of adjustment to actual climate and its effects" (AR6 804). Not only does this distinction invoke environmental communication's concerns with the separation of human from natural systems but emphasizes that it is a networked and localized phenomenon, shaped by distinct ecological, social, and institutional constraints.

This instability becomes even more apparent when examining the glossary's extensive variations of the term. The IPCC offers definitions for adaptive capacity, adaptation behavior, adaptation pathways, adaptation options, and more—each emphasizing feasibility, limitations, and context-specific constraints. Whether an adaptation strategy succeeds depends not only on climate conditions but also on who decides what adaptation looks like, when it should happen, and for whom. The glossary does not acknowledge that adaptation is always a political act, shaped by institutional priorities, policy agendas, and competing stakeholder interests. Those in power determine adaptation strategies, setting timelines that may not align with the lived realities of affected communities. Thus, while the IPCC frames adaptation as a stable, actionable concept, its glossary reveals that adaptation is both situational and deeply embedded in systems of governance and control, making true immutability impossible.

Taken together, risk, vulnerability, and adaptations illustrate a broader pattern in the IPCC's glossary: definitions that appear stable in isolation but become fluid when applied in real-world contexts. While the glossary attempts to function as an immutable reference point, its terms inevitably shift depending on their enactment. The following section examines this mobilization in practice, tracing how these terms are invoked across different AR6 enactments and whether the IPCC's claims to stability hold beyond their definitional framing.

IMs in Movement

While the glossary serves as a critical site for investigating the IPCC's strategies to stabilize terminology, it is far from the only location where meaning is shaped. The previous section demonstrated how stabilizing these terms paradoxically requires interpretive flexibility. However, it is through their mobilization within AR6 enactments that this instability becomes even more apparent. As a multinational document designed to inform scientific discourse, governmental decision-making, and public communication, AR6 further destabilizes these terms as they are transported between contexts. This mobilization reveals the rhetorical and definitional limits of immutability—terms bound by the glossary must adapt to meet distinct institutional, political, and disciplinary needs.

This analysis examines whether these terms maintain their advertised stability in the face of contextual variability or whether mobilization inherently necessitates fluidity. Specifically, it investigates how glossary-defined meanings shift when applied across different rhetorical and social demands. By tracing how risk, vulnerability, and adaptation are enacted in AR6, the SPM, and HS document, this section interrogates whether IMs can retain their stability in motion. If immutability is challenged in these documents—each designed for distinct audiences—it suggests that stability in high-stakes climate discourse is not only unattainable but must be deliberately negotiated to retain meaning.

Risk: Calculations, Trade-offs, and Policy Framing

The term risk provides a compelling example of how definitions evolve across AR6 enactments. One key factor destabilizing the term is the interplay between confidence levels and specificity; as information moves from the Synthesis Report to the SPM and the HS, confidence levels increase, while specificity decreases. This shift reflects the challenge of translating complex, probabilistic scientific knowledge into broader, more accessible claims. As risk is mobilized across these enactments, it transforms: in the Synthesis Report, it exists as a contingent and system-dependent calculation; in the SPM, it becomes an actionable policy concern; in the HS, it is streamlined into an urgent certainty. This process highlights both the necessity and the consequences of stabilizing scientific discourse for different audiences.

The transformation described is evident in section 3.1.3 of the Synthesis Report, which assesses global risk trajectories over the next 80 years. The lead authors outline an expansive range of climate risks: species extinction, irreversible loss of Greenland and West Antarctic ice sheets, sea-level rise, food insecurity, and economic and infrastructure vulnerabilities. While the breadth of claims is vast, the assigned confidence levels vary significantly. The report states with very high confidence that coral reefs will face irreversible loss and that it is virtually certain that sea levels will rise. However, when addressing risks associated with large-scale tipping points—such as ice sheet collapse—the certainty diminishes: limited evidence exists for the melting of certain ice sheets, and the authors assign medium confidence to the likelihood of tipping points occurring between 1.5 to 2.5ºC of warming (AR6 77).

This section reveals a paradox in the way risk is defined and mobilized. While the IPCC glossary presents risk as a structured, immutable concept, the Synthesis Report demonstrates that risk assessment is always contingent on shifting confidence levels, evolving evidence, and localized conditions. Latour's conception of IMs as combinable and transportable objects

(Visualization and Cognition 30) suggests that risk should function as a stabilized framework for assessing climate hazards across contexts. However, in practice, risk resists perfect immutability because it is not a fixed object—it is a relational construct that depends on a matrix of uncertainty, exposure, and impact. The glossary's definition allows risk to appear stabilized, but in practice, its meaning is shaped by the epistemic boundaries of probability assessment and scientific consensus. This instability is present even in the glossary's own language, which acknowledges that "hazards, exposure and vulnerability may each be subject to uncertainty in terms of magnitude and likelihood of occurrence, and each may change over time and space due to socio-economic changes and human decision-making" (Annex I Glossary 822). Although the glossary appears to offer a singular, structured definition, it quietly concedes that the very elements comprising risk are dynamic and contingent.

This instability becomes even more pronounced when risk is discussed not only in terms of climate hazard probabilities but also through the social and infrastructural conditions that amplify those risks. Later in the Synthesis Report, the IPCC notes that "many climate-associated risks to natural and human systems depend more strongly on changes in these systems' vulnerability and exposure than on differences in climate hazards between emissions scenarios" (AR6 98). This framing reveals a shift in emphasis: risk is not only a function of hazard but also of sociopolitical dynamics like urbanization, inequality, and resource dependency. The report underscores that "future exposure to climatic hazards is increasing globally due to socio-economic development trends," and that risks concentrate in spaces like informal settlements and small rural towns (AR6 98). This articulation of risk—bound to uneven development and social precarity—renders the concept highly contextual, challenging the idea that it can be universally measured or uniformly communicated. As climate hazards cascade and compound across

systems (e.g., heat, drought, labor productivity loss), risk emerges not as a static threat but as an evolving condition shaped by complex interdependencies. This shifting and mutating vision of how risk is calculated and communicated becomes even more unstable when layered with the uncertain language of confidence qualifiers.

Although the glossary provides a stabilized framework for risk, the uncertainty embedded in confidence levels produces a fundamental instability. The IPCC qualifies risk assessments using terms such as "virtually certain," "high confidence," and "medium confidence," yet these qualifiers are never assigned statistical framing or strict definitions. Instead, they are "grounded in an evaluation of underlying evidence and agreement" (AR6 38), leaving their interpretation open-ended. Because these confidence levels are not standardized, their meaning is contingent on the reader's perception, disciplinary background, and institutional priorities. What one researcher considers "high confidence," another might classify as "medium confidence." This subjectivity introduces fluidity into the term, making risk an inherently negotiated concept rather than a fixed scientific measurement.

This instability becomes more pronounced in the Summary for Policymakers (SPM), where risk shifts from a site of interpretive flexibility to a rhetorical tool for decision-making. The SPM distills the 77-page synthesis report into a condensed 31-page document, requiring the omission of lower-confidence risks and a focus on transnational and large-scale concerns. As a result, risk is framed with higher certainty but less specificity. Confidence qualifiers such as "high confidence" and "virtually certain" become dominant, while "medium confidence" appears far less frequently than in the Synthesis Report. This shift reflects the demands of policymaking, where clear directives are prioritized over nuanced probability assessments. However, by

removing specificity, the term risk becomes increasingly detached from its original contextual meaning, leading to new forms of mutability.

N "Nowhere is this shift clearer than in section B.4.3 of the SPM, where the IPCC discusses risk assessment in the context of adaptation policy. The report states that "actions that focus on… risks in isolation and on short-term gains often lead to maladaptation over the long term, creating lock-ins of vulnerability, exposure, and risks that are difficult to change" (AR6 19). Here, risk is not a standalone concept but is inextricably tied to other volatile terms such as (mal)adaptation, vulnerability, and exposure. However, rather than providing a spectrum of possible maladaptive outcomes, as in the Synthesis Report, the SPM gives a single case study of seawall implementation, presenting it as a representative example. This narrowing of scope, while rhetorically effective, limits interpretative flexibility—forcing policymakers to apply broad conclusions to vastly different regional contexts.

This tendency to universalize without local grounding is echoed elsewhere in the report. For instance, the SPM claims that "Disaster risk management, early warning systems, climate services and risk spreading and sharing approaches have broad applicability across sectors" (30). Unlike the seawall example, which at least names a single adaptation strategy, this assertion makes a sweeping, high-confidence claim without identifying a specific sector, region, or implementation context. This generalization further abstracts the concept of risk, suggesting broad utility without attending to the conditions that shape effectiveness. Without deeper engagement in how risk is managed across different scales and sectors, the SPM transforms risk into an authoritative but abstracted concept—one that is more legible but less representative of climate variability.

This rhetorical streamlining is especially evident in how the SPM narrates risk in relation to warming scenarios. In the written description accompanying Figure SPM.4, the IPCC introduces "selected global risks for land and ocean ecosystems" and "selected risks under different socio-economic pathways" (AR6 18), yet these assessments remain conspicuously decontextualized. Risk is discussed with consistent "high confidence," but no geographic regions, population groups, or economic categories are named. Even when referencing outcomes such as food insecurity or heat-sensitive health conditions, the report avoids specifying which regions are affected or how risk is being quantified. Instead, it flattens these risks into abstract, universally legible outcomes that prioritize policy clarity over contextual accuracy. The SPM thus reframes risk as a generalized, scalable metric—one that maintains the illusion of certainty while erasing the place-based dynamics and socio-political conditions that make climate risks unevenly distributed. As a result, risk continues to mutate, not only in probability but in rhetorical function, becoming less about hazard assessment and more about translatability across global governance frameworks.

The Headline Statements document serves as the final enactment of AR6, distilling complex findings into streamlined claims for public and policy engagement. While this clarity aids circulation, it further destabilizes the term risk by stripping away key nuances. Unlike the SPM, which still acknowledges uncertainties, the HS exclusively emphasizes risks with "high confidence," reinforcing the perception of stability while eliminating probabilistic assessments and context-dependent interpretations (B.1-7). This shift makes risk appear definitively immutable, presenting it as an uncontested truth rather than a contingent assessment shaped by evolving climate research and regional variability.

This oversimplification carries significant consequences. By prioritizing only the most certain risks, the HS obscures the inherent complexity of risk assessment—a process deeply tied to geographic hazards, infrastructure, and local response capabilities. In doing so, the IPCC's terminology functions less as a flexible interpretive tool and more as a persuasive mechanism designed to mobilize action across audiences while sacrificing granular specificity.

However, risk cannot be fully understood outside of localized scales and spatial variability. While the SPM offers broader multinational assessments, all climate risk research encounters challenges in applying findings at regional levels. The IPCC's own acknowledgment of this limitation is seen in the second working group's assessment of global risk distribution:

> The development of [synthetic diagrams modeling key risks] for Small Islands, Asia, and Central and South America was limited due to the paucity of adequately downscaled climate projections, uncertainty in the direction of change, the diversity of climatologies and socioeconomic contexts across countries within a region, and the resulting new numbers of impact and risk projections for different warming levels. (AR6 76)

This passage illustrates a fundamental asymmetry: risk assessments are more precise for data-rich, high-resource regions, while assessments for "developing nations" remain uncertain and generalized. The ability to define and quantify risk is directly tied to the availability of scientific infrastructure, economic investment, and geopolitical prioritization. As a result, while the IPCC presents risk as a universal metric, its application is uneven; it offers highly detailed assessments for wealthier regions while leaving vast portions of the world with vague, less actionable data.

This limitation is critical because risk, as framed by the IPCC, is fundamentally a measurement of physical exposure to hazards. It assesses what could happen and where, relying on predictive modeling and probability distributions. However, as AR6 demonstrates, risk

assessments do not function independently of political and social structures, which speaks into a discussion of vulnerability**.** If risk represents potential threats in physical space, vulnerability determines who is most affected, why exposure is unequally distributed, and how power structures shape resilience.

Vulnerability: Labeling Communities and Institutional Power

While the discussion of risk demonstrated how instability emerges through shifting confidence levels and decreasing specificity across enactments, vulnerability presents a different kind of mutability—one that is not rooted in a lack of specificity, but in the power dynamics of who gets to assign vulnerability. Unlike risk, which requires localized assessment of exposure and hazards, vulnerability is a designation imposed by institutions, shaping who is seen as in need of aid, protection, or intervention. This designation is not neutral, rather, it reflects and reinforces pre-existing social and geopolitical hierarchies.

Vulnerability is not a static condition, but a label assigned by dominant institutions like the IPCC. Who gets to be considered vulnerable? Who decides? The very act of labeling communities as vulnerable creates instability, as it obscures the systemic forces that produce that vulnerability in the first place. Vulnerability, as defined in AR6, is framed as an inherent condition, one shaped by geography, economic precarity, or marginalized identities, without addressing the larger political and economic structures that create those conditions: "Vulnerability is higher in locations with poverty, governance challenges, and limited access to basic services and resources, violent conflict and high levels of climate-sensitive livelihoods… is exacerbated by inequity and marginalization linked to gender, ethnicity, [etc.]" (51). By focusing on who is vulnerable rather than why they are vulnerable, the IPCC reinforces a framing that treats vulnerability as something to be managed rather than structurally changed.

The Synthesis Report reflects this instability in its categorization of vulnerability by stratifying regions according to economic development. Section 2.1.2 groups nations into broad categories such as "developed," "developing," and "least developed," treating these labels as inherent characteristics rather than shifting geopolitical constructs. While some of these distinctions follow UN classifications, others remain vague and inconsistent: "There is a diversity of approaches to categorizing countries on the bases of their level of development, and for defining terms such as industrialized, developed, or developing" (AR6 123). This imprecise classification system directly affects how vulnerability is framed. If the boundary between "developing" and "developed" shifts depending on the context, then vulnerability itself becomes a flexible designation rather than a fixed condition. Vulnerability is not defined by objective risk factors alone; it is shaped by rhetorical and geopolitical priorities. The IPCC does not merely describe vulnerability but arguably participates in its construction through classification systems that determine which nations are seen as at risk and which are presumed to have resources to adapt.

In that same vein, the Synthesis Report consistently ascribes vulnerability to social and economic groups, reinforcing an anthropocentric and institutionally driven framework. While climate change threatens ecosystems, non-human species, and geologic structures, the IPCC primarily frames vulnerability in terms of human networks and economic precarity. Across the report, vulnerability is frequently used as a proxy for economic status—those with lower income, reduced access to resources, or informal housing are repeatedly labeled as vulnerable (AR6 78; 111; 113). This pattern reflects not only material risk, but also a tendency to naturalize economic disadvantage as an inherent condition, rather than interrogating the systems that produce and sustain it. The report explicitly connects vulnerability to gender, inequity, governance issues,

poverty, marginalization, ethnicity, and Indigenous Peoples and local communities (AR6 51; 101). Although these considerations are critical for addressing inequality and resource distribution, this framing excludes non-human systems from being considered vulnerable in the same way. Even as the IPCC acknowledges ecosystem collapse and mass extinction as climate risks, it does not apply the term vulnerability to these threats—suggesting that vulnerability, as constructed by the IPCC, belongs only to human communities and economic systems.

By reserving vulnerability for social and economic systems, the IPCC reinforces a hierarchical, anthropocentric lens, which prioritizes human precarity while relegating environmental destruction to an adjacent, less urgent category of harm. This omission does not just challenge the supposed immutability of the term; it also reveals how power structures influence whose vulnerability is acknowledged and whose is overlooked. If vulnerability were applied more broadly, it might demand a more radical shift in climate policy that prioritizes non-human actors and networks. Instead, by tying vulnerability to human economic structures, the IPCC reinforces a status quo where climate responses are framed around economic and political feasibility rather than ecological necessity.

This human-centered construction of vulnerability becomes even more pronounced in the SPM, where the term is erased altogether. While the synthesis report invokes vulnerability over 30 times in section 2.1.2 alone, the SPM omits entirely from these same sections. Rather than assessing vulnerability as an ongoing or future condition, the SPM shifts its focus to damages that have already occurred. For example, rather than discussing how urban populations are vulnerable to climate change, the report states:

> In urban areas, observed climate change has caused adverse impacts on human health, livelihoods, and key infrastructure. Hot extremes have intensified in cities, Urban

> infrastructure, including transportation, water, sanitation, and energy systems have been compromised (AR6 6).

This shift is more than just a simplification of the synthesis report; it transforms vulnerability from a systemic condition into a series of past and present damages. Rather than positioning vulnerable communities as active participants in shaping climate adaptation, the SPM presents damage as an inevitable outcome. It is this reduction of vulnerability to only the explicit outcomes that reduces the urgency for systemic intervention.

This omission signals a further destabilization of vulnerability, not just through vague economic boundaries or anthropocentrism, but through erasure. Where vulnerability dominates the synthesis report—attempting (successfully or not) to locate and define precarity—the SPM sidesteps the term entirely, shifting from an assessment of vulnerability to a neutral statement of consequences. This shift does not simply condense information; it fundamentally alters the function of vulnerability itself. Instead of operating as a stable, consistently applied concept, vulnerability is strategically rewritten out of the SPM's framing, suggesting that its rhetorical usefulness collapses as its circulation becomes more streamlined. The question then becomes: what happens when vulnerability is made invisible? What does it mean when a term, central to discussions of systemic precarity, is erased precisely at the moment when it is supposed to be actionable?

The HS represents the final stage of this rhetorical collapse. Here, the issues of vagueness and erasure reach their most unstable form. Unlike the SPM, this document does invoke vulnerability, but in an amorphous, ambiguous way. Instead of anchoring vulnerability to specific economic structures, social groups, or regional contexts, it presents the term as a floating, undefined concept: "Vulnerable communities who have historically contributed the

least to current climate change are disproportionately affected" (Headline Statements A.2). Notably, unlike the synthesis report, this version does not explicitly reference human systems at all. This omission further abstracts the concept, removing any concrete indication of who or what constitutes a "vulnerable community"—human or non-human, economic or ecological, individual or collective. Without specificity, vulnerability functions less as a descriptor of actual precarity and more as a symbolic placeholder for harm itself, emptied of its ability to guide action or policy.

By the time vulnerability reaches its final stage of mobilization in the HS, it has been transformed into an IM that paradoxically appears more stable as it becomes more fluid. Because the term is presented as self-evident and universally applicable, its meaning becomes unfixed and interpretatively flexible—allowing audiences to map their own assumptions onto it. Yet, this flexibility comes at a cost: by resisting specificity, the term loses its ability to direct interventions or demand accountability. In its effort to be widely circulated and universally legible, vulnerability is rendered rhetorically hollow: a term that signals urgency without offering a framework for action.

Adaptation: Institutional Timelines and Political Constraints

While risk becomes unstable due to its lack of physical grounding, and vulnerability shifts through the social and political systems that determine who is labeled as vulnerable, adaptation's instability arises from its entanglement in contingent, unstable timeframes. Unlike vulnerability, which is imposed as a label, adaptation is framed in AR6 as a strategic intervention—one that requires knowing the "right time" to act. However, kairos, or the rhetorical timeliness of action, is made uncertain by the unpredictability of climate crisis development itself. AR6 does not prescribe universal timelines for adaptation but instead situates urgency within conditional projections: if global warming reaches 1.5°C, adaptation is critical in

one way; if it surpasses 2°C, the window for action shifts entirely (AR6 88). The timeline for adaptation, then, is always contingent and shaped by emerging climate conditions, geopolitical decisions, and the cascading effects of previous (in)action.

This instability is further compounded by who gets to determine these timeframes. While the glossary presents adaptation as a neutral and universal concept, the discussions in AR6 enactments reveal that decisions about when to implement adaptation strategies are dictated by institutions, governing bodies, and global actors who wield the power to define urgency. Adaptation, then, does not exist in a fixed temporal frame—it is an ongoing negotiation, made unstable by both unpredictable environmental shifts and the political structures that dictate when, where, and for whom adaptation is possible.

This instability becomes apparent in the Synthesis Report's discussion of adaptations in section 3.2. The lead writers acknowledge that as global temperatures rise, adaptation strategies will face increasing constraints, yet the timing of their effectiveness remains undefined. While the report categorizes adaptation limits by projected warming levels—hydro/thermoelectric energy adaptation strategies become constrained at 1.5ºC, agricultural adaptations lose effectiveness at 2ºC, and (agro)forestry strategies reach hard limits at 3ºC (AR6 78)—these classifications lack a clear sense of when implementation should occur to optimize effectiveness.

While these projections help illustrate what adaptation challenges may arise, they introduce rhetorical instability by outlining urgency without specifying actionability. If a strategy is likely to become ineffective at 2ºC of warming, does that mean it must be implemented now, in five years, or after other interventions fail? By omitting concrete timeframes, the report leaves the timing of adaptation up for interpretation, weakening its capacity to guide decision-making. This rhetorical gap shifts the burden of responsibility, placing future generations or vulnerable

communities in a position where they must react to unfolding crises rather than proactively mitigating them: “both climate scientists— and carbon lobbyist-led deliberations leave future generations to inherit the burden of their current calculations” (Pflugfelder 18).

Despite outlining a wide array of “effective adaptation options”—from health action plans to early warning systems and social protection programs—the Synthesis Report provides little guidance on when or how these strategies should be implemented. Many of these interventions are framed as “highly feasible” and backed by “high confidence” or “robust evidence,” yet they are introduced without reference to specific timelines, infrastructural thresholds, or context-dependent constraints. For instance, the report notes that “universal access to healthcare” is a “key pathway to climate resilience in the health sector” (AR6 107), yet it provides no indication of how or when such access could be achieved, or which regions currently lack it. Elsewhere, it asserts that “climate literacy and information provided through climate services and community approaches, including those that are informed by Indigenous Knowledge and local knowledge, can accelerate behavioural changes and planning (high confidence),” again offering no guidance on where, how, or under what conditions this might be possible. These lists signal political will without establishing political responsibility—cataloguing potential without prescribing intervention. By presenting adaptation as abundant and technically possible but offering little clarity on operational urgency, the report frames adaptation more as a conceptual ideal than an actionable imperative. This rhetorical gap reinforces the instability of the term, allowing institutions to cite adaptation options without committing to their implementation.

In contrast to the glossary, which presents adaptation as a stable, ongoing process, the Synthesis Report’s framing exposes the difficulty of identifying a definitive kairotic moment for

action. The instability of adaptation is not just a linguistic issue—it is a political and ethical one. Without defined temporal parameters, adaptation strategies remain hypothetical rather than actionable, making it easier for institutions to delay responsibility, shift accountability, and leave crucial decisions unresolved.

This temporal instability in the enactment of adaptations becomes further amplified as we move into the SPM. While the Synthesis Report anchors adaptation limits to specific warming thresholds (e.g., hydroelectric strategies declining at 1.5ºC, agricultural adaptation limits appearing at 2ºC, and forestry adaptation barriers forming at 3ºC), the SPM removes these explicit markers, leaving adaptation even more loosely defined. Nearly every subsection of section 3.2 in the Synthesis Report ties adaptation feasibility directly to temperature milestones, yet in section B.4 of the SPM, explicit temperatures appear only once. Instead, adaptation is framed through generalized, indefinite timelines: "The effectiveness of adaptation… will decrease with increasing warming. As adaptation options often have long implementation times, long-term planning increases their efficiency" (AR6 19). By replacing precise temperature-based thresholds with ambiguous references to "long implementation times" and "long-term planning," the SPM strips adaptation of a clear kairotic moment—obscuring when, precisely, a given strategy should be deployed to avoid its limits.

This shift from specific to abstract not only erodes clarity but also places responsibility on policymakers to determine feasibility, without concrete temporal guidance to anchor decision-making. Because adaptation strategies are bound to unpredictable climate trajectories, it becomes impossible to define a single "right moment" for implementation. In Post-Normal Science (PNS) terms, adaptation operates under conditions where facts are uncertain and decisions urgent. The SPM's reliance on indefinite timeframes mirrors PNS's critique of traditional scientific

methods—when faced with high uncertainty and complexity, knowledge can no longer function as fixed and authoritative. Instead of providing stable guidance, adaptation's timeline becomes a contested and institutionally driven decision rather than a scientifically determined necessity (see AR6 8; 19).

This increasing abstraction reaches its peak in the Headline Statements (HS) document, where adaptation is framed in even broader, less temporally anchored language. Unlike the Synthesis Report, which at least ties adaptation feasibility to specific warming thresholds, and the SPM, which removes temperature markers but retains some urgency, the HS document strips adaptation of nearly all concrete reference points. Instead, adaptation is framed as a general principle—it "will become constrained and less effective with increasing global warming," and yet, maladaptation "can be avoided by flexible, multi-sectoral, inclusive, long-term planning" (Headline Statements B.4). This framing signals a final shift from adaptation as a process bound by time-sensitive action to an indefinitely ongoing, flexible strategy—one that policymakers must navigate without clear temporal constraints. The consequence is that adaptation, in its most widely circulated form, is presented as both urgent and perpetually possible, reinforcing its mutability as an IPCC IM.

Having traced how risk, vulnerability, and adaptations function within AR6 enactments, this analysis demonstrates that the IPCC's attempts at stabilization inevitably produce new forms of instability. While the glossary seeks to construct a fixed interpretive frame, its terms shift across different audiences and institutional needs, revealing that immutability in scientific terminology is neither entirely achievable nor neutral. Risk, originally presented as an objective calculation, morphs as confidence qualifiers and probabilistic framing shifts its meaning. Vulnerability, supposedly a stable designation, is an imposed label shaped by political and

economic structures. Adaptation, framed as an actionable strategy, becomes decoupled from clear timeframes, making urgency a function of institutional decision-making rather than objective necessity.

Findings

The patterns of instability that are spoken to above reinforce two critical conclusions. First, IMs must be further boundaried to remain relevant in post-normal science contexts. Unlike boundary objects, which have been explicitly constrained by scholars such as Susan Leigh Star, IMs currently encompass too broad a range of objects—capable of including terminology itself. This analysis suggests that while Latour's original conception allows for terms to function as IMs, in practice, they cannot retain immutability across the shifting assemblages of climate discourse. Second, definitional spaces such as glossaries must move away from absolutist claims of stability. The IPCC constructs its glossary as a fixed interpretive guide, yet this study has shown that no term—regardless of its framing—can function immutably across all contexts. Scientific discourse must acknowledge that definitions will always shift in their mobilization, rather than insisting on stability where none can exist.

Immutable mobiles, as originally theorized by Latour, were designed to describe scientific inscriptions that could be transported across contexts while retaining their integrity. However, the findings of this study challenge this assumption when applied to terminology, revealing that words—even when explicitly defined—do not function as fixed and immutable objects. Instead, they shift in response to political, social, and rhetorical pressures, meaning that their mobilization inevitably invites reinterpretation rather than stabilization.

This calls for a critical reassessment of how IMs are conceptualized and applied. Boundary objects offer a precedent for how theoretical refinement can address misapplication. Twenty-one years after coining the term, Star revisited her concept to clarify its boundaries,

responding to repeated questions such as, "'Well, but what is NOT a boundary object?' (or, along the same lines, 'Couldn't anything be a boundary object?')" ("This is Not a Boundary Object" 604). The persistence of these questions revealed a need to constrain the definition, ensuring that the concept remained analytically useful rather than overly expansive.

Unlike boundary objects, which have undergone this process of refinement, IMs remain theoretically unbounded. If they are to continue serving as a meaningful tool for analyzing stability in knowledge production, they require clearer delineation of what qualifies as an IM and what does not. Latour's original theorization provides a compelling foundation, but its application to terminology exposes conceptual gaps. Individual terms meet the criteria of IMs—they are recombinable, superposable, and capable of transporting knowledge—but their inherent mutability challenges the assumption that IMs preserve stability across contexts. Just as Star redefined boundary objects to prevent overgeneralization, IMs must be reexamined and reclassified to account for the instability revealed through their mobilization in high-stakes discourse.

This study demonstrates that the inherent instability of terminology in scientific discourse necessitates a reconfiguration of IMs to constrain what qualifies as "immutable." While Latour acknowledges that IMs condense, omit, and selectively represent data (Pandora's Hope 28–29), this analysis suggests that these very processes—though necessary for mobility—can introduce instability when applied to linguistic terms. To retain their analytic usefulness, IMs may need to be redefined not in opposition to synthesis per se, but in terms of how well they preserve interpretive complexity and remain open to contextual recombination.

This does not imply that IMs must rely solely on "raw" or unsynthesized data—an ideal that scholars in STS have long problematized as itself constructed through the choices and assumptions embedded in collection methods. Rather, this study points toward a more layered and reflexive understanding of immutability: one in which IMs preserve the multivalence of their underlying data and make visible the conditions of their creation. Under this revised framework, charts, maps, and diagrams—objects Latour originally offered as exemplary IMs—would need to be reassessed. Tools that prioritize clarity over completeness may no longer meet the threshold for immutability. Instead, truly robust IMs would be those that retain the full complexity of what they represent across contexts: e.g. a series of topological, geological, and political maps that, when layered together, offer a more holistic and pluralistic rendering of a region. These kinds of multi-perspective, recombinable artifacts better fulfill the spirit of Latour's vision by resisting premature simplification and allowing meaning to travel without flattening.

Of course, even within this refined framework, absolute immutability remains an impossible ideal. Any object mobilized across assemblages will be subject to shifts in interpretation, contextualization, and application. However, this reconfiguration strengthens the concept of IMs by ensuring that their stability is not predicated on selective simplification, but rather on the retention of complex and contradictory elements. While no knowledge-stabilizing tool can transcend the contingencies of interpretation, this revised understanding of IMs moves closer to an operational model that mitigates instability rather than amplifying it.

The IPCC's "Annex I Glossary" claims to encapsulate the intended interpretations of AR6, offering a fixed reference for key terms (Annex 803). However, this study demonstrates that no single definitional space can account for the full range of interpretations necessary for a document of this scale. The failure of the glossary stems from the fact that definitions, no matter

how precisely crafted, cannot fully dictate meaning once a term is mobilized. The glossary provides an illusion of immutability—offering the appearance of fixed, stable definitions—but in practice, these definitions are immediately refracted through the contexts, disciplines, and rhetorical needs of those engaging with the text. Policymakers, scientists, and the general public all bring distinct frames of reference to their reading of AR6, which means that a term such as risk, vulnerability, or adaptation will necessarily shift in meaning as it moves between audiences.

Rather than presenting definitions as fixed, authoritative reference points, definitional spaces in high-stakes scientific discourse must instead acknowledge and incorporate interpretive flexibility. If instability is an inherent feature of knowledge movement, then definitional work should be structured to recognize this reality rather than resisting it. This can take many forms: multi-perspective glossaries that reflect the interpretations of different stakeholders (Smith and Merkle); dynamic, living glossaries that evolve as readers engage with the text; or embedded glossaries with citations and hyperlinked resources that ground definitions in their disciplinary contexts (Bansard and Eni-ibukun). While no glossary can prevent terminology from shifting as it is received and enacted, definitional spaces crafted with built-in recognition of instability do not just mitigate misinterpretation, they may also help democratize the process of defining, enabling a more adaptive and inclusive process of reading and meaning making.

These findings reinforce a broader reality about the construction and mobilization of scientific knowledge: stability is not an inherent feature of discourse, but a strategic construction that is always, to some degree, contingent. While IMs and definitional spaces aim to mitigate instability, they often function instead to obscure it—promising fixed interpretations where none can truly exist. By reconfiguring IMs to account for their inherent mutability and rethinking how

scientific glossaries frame their definitions, we can begin to address the fundamental challenge of stabilizing knowledge in post-normal science contexts.

However, these findings raise further questions about how high-stakes scientific institutions—such as the IPCC—might adapt to these realities without sacrificing their authority or clarity. If stability is always contingent, how should scientific bodies communicate uncertainty without undermining trust? How can definitional spaces acknowledge mutability while still guiding interpretation? The concluding chapter reflects on these challenges, considering how the limitations of stability might reshape the way we approach climate discourse and scientific communication more broadly.

Conclusion

Scientific discourse is often structured around the need to stabilize, transport, and mobilize knowledge across contexts. However, this study emphasizes that immutability and stability must always be renegotiated and reconstructed as findings move across different audiences. While the Intergovernmental Panel on Climate Change (IPCC) attempts to define and control the interpretation of key terms such as risk, vulnerability, and adaptation, their mobilization across different enactments of Sixth Assessment Report (AR6) reveals a fundamental instability in scientific terminology: risk cannot be stabilized when it is not grounded in localized and situated contexts; vulnerability becomes unstable when examined through the power dynamics that determine who applies the label and to whom; adaptation loses its actionable force when it is not bound to a specific timeframe in which strategies remain effective.

These sites of instability and uncertainty shaped the core findings of this study. First, immutable mobiles (IMs)—compressed, curated, and stable objects designed for scientific use across contexts—must be redefined and boundaried to remain applicable in post-normal scientific discourse. To retain their analytical utility, IMs may need to reference "raw," non-synthesized datasets rather than the curated and simplified representations traditionally associated with them. While Latour's original theorization categorized maps, charts, and processed datasets as IMs, this study demonstrates that objects containing multitudes are inherently unstable in practice; they are always condensed versions of the processes that produced them. For an IM to remain operational and stable across contexts, it must encapsulate the complexity of its underlying data, rather than selectively filtering or simplifying information.

The second finding focuses on stability in definitional work, particularly how individuals and institutions construct meaning in spaces such as glossaries and footnotes. I argue that for

definitions to remain both stable and transportable, scientific discourse must acknowledge the limitations of fixed definitions and create space for audience participation in shaping how terms are operationalized. This could take multiple forms: definitional spaces that incorporate multiple interpretative frames, tailored to the diverse audiences engaging with the text; glossaries that not only define terms but also provide citations, hyperlinks, and contextual guides to help readers understand when, where, and how terms take on different meanings. Rather than presenting definitions as static, these structures would embrace interpretive flexibility while still guiding understanding—allowing stability to emerge from contextual adaptability rather than rigid constraint.

While science communication must acknowledge the inherent instability and fluidity of knowledge, this study suggests that stability is not an unattainable goal but one that requires a different conceptual approach. Instead of seeking a single, universally applicable framework for stabilization, scientific discourse must adopt a layered, pluralistic approach in which different epistemologies and contexts shape how knowledge is structured, interpreted, and mobilized. This study builds on Annemarie Mol's view that stabilization should not be viewed as the imposition of fixed meanings but as a process of alignment and one that enables knowledge to persist across contexts without demanding uniformity. In her book *The Body Multiple*, she asserts that constructing a stabilized whole does not entail enforcing a single lens or framework but rather involves mapping and negotiating different ways of knowing to produce a more functional and comprehensive understanding. To speak to a wide array of audiences and to adapt language so it is actionable and rhetorically stable, scientific communicators have a responsibility to situate and maintain complex and shifting knowledge structures rather than trying to simplify their multiplicities.

The need for pluralistic stabilization is not just theoretical—it is crucial for maintaining scientific credibility in an era where uncertainty is increasingly politicized. The findings presented here align with long-standing critiques of scientific knowledge and its movement, but they take on renewed urgency in light of recent calls for clearer, more transparent, and actionable scientific communication. In recent years, anti-intellectual and anti-science movements have increasingly leveraged uncertainty not to refine knowledge, but to obstruct action (see Desikan et al.; Union of Concerned Scientists). This erosion of trust extends beyond climate discourse into public health, AI use and policy, and technological innovation—fields where ambiguity is weaponized to justify inaction (Saltelli). If scientific knowledge is to remain both authoritative and actionable, scholars in STS, rhetoric, and science communication must develop frameworks that work with, rather than against, interpretive instability.

With this surge in distrust permeating political and social spheres, these findings intersect with and contribute to ongoing efforts within academic and scientific communities. Organizations such as NASA, NOAA, NIH, and the CDC have begun integrating Open Science Frameworks (OSF), which aim to make data, processes, and findings more transparent and accessible as research circulates (see NASA; Science.gov). These initiatives reflect a growing recognition that trust in scientific knowledge cannot be maintained through authority alone—it must be earned through openness and accountability. An OSF, aligned with John Law's vision of the inherent messiness and complexity of scientific processes, underscores the need for scientists to make this messiness visible rather than concealing it behind artificially stable conclusions. To counter distrust and promote a more democratic, locally adaptable approach to science communication, the entire research process—not just its final outputs—must be accessible.

Findings and publications should incorporate the multiplicities that arise at each stage of scientific inquiry, allowing knowledge to remain transparent while still embracing complexity.

Though instability and interpretive fluidity in communication are well-documented across STS and rhetorical studies, the findings of this thesis offer a new way of thinking about how to address these issues when implementing OSF in high-stakes, contentious discourses. While the term immutable mobiles is not a dominant framework within scientific publishing, my reconfiguration of how they function offers a new perspective on how OSF should operate in scientific communication. Rather than conceptualizing IMs as maps, charts, or processed datasets—objects that condense and simplify knowledge for mobility—I argue that they should instead refer to unsynthesized datasets and collections of materials that preserve complexity rather than obscuring it.

This reframing offers a potential intervention that could inform how OSF is theorized and applied: if OSF aims to increase transparency, then it must not only make knowledge accessible but also maintain the interpretive history and layered complexity of data rather than prematurely stabilizing it into authoritative conclusions. By treating IMs as inherently complex and multiple rather than finalized knowledge artifacts, this study suggests that OSF initiatives should not only focus on making research accessible but also on preserving the process through which knowledge is shaped—ensuring that the complexities, uncertainties, and interpretive shifts in scientific discourse remain visible rather than erased in the pursuit of stability.

With organizations such as NASA, NOAA, and the CDC integrating OSFs as a baseline (or at least an end goal), the push for transparency cannot stop at preserving methodological complexity or at acknowledging the multiplicity embedded within final reports like AR6. It must also extend beyond the publication itself into the frameworks that govern how key terms and

definitions are mobilized and interpreted in localized contexts. My second finding, which emphasizes the need for democratized, living glossaries—definitional spaces that track multiple interpretations and make visible where and how those meanings were constructed—identifies another key area where OSF can be practically applied. By integrating open, evolving definitional tools alongside data-sharing initiatives, these organizations can ensure that transparency extends not only to the datasets as they were originally constructed but also to the shifting terminologies that shape scientific discourse wholesale.

Ultimately, these applications of OSF reinforce the larger argument of this study: that knowledge in high-stakes scientific discourse cannot be stabilized through fixed definitions or singular frameworks. Whether through open data initiatives, evolving glossaries, or redefined stabilization tools, the challenge is not simply to make scientific knowledge more accessible but to ensure that accessibility does not come at the cost of interpretive flexibility. The reconfiguration of immutable mobiles and the call for dynamic definitional spaces are not just theoretical interventions, they represent significant theoretical interventions that could reshape how we conceptualize stability, communication, and scientific credibility. By acknowledging that stability is always contingent, scientific discourse can move beyond the illusion of fixity and toward a model that embraces complexity while remaining actionable, transportable, and trusted.

Rather than seeking to erase instability, the challenge ahead is learning how to stabilize knowledge in ways that remain accountable to the complexities of meaning, context, and use. If knowledge is always shifting, then the challenge is not to fix it in place, but to build systems that allow it to move while remaining legible, credible, and adaptable. Scientific discourse does not need a perfected immutability; rather, it needs transparency and the ability to respond to the localized needs of its audience. By embracing this shift, we do not weaken scientific

communication—we strengthen it. Stability need not mean rigidity, nor must fluidity mean chaos. Instead, knowledge must be allowed to move, to grow, and to remain meaningful as it is taken up by new audiences and adapted to new challenges.

Work Cited:

Abreu Gonçalves, Fernando, and José Figueiredo. "How to Recognize an Immutable Mobile When You Find One." *International Journal of Actor-Network Theory and Technological Innovation*, vol. 2, no. 2, 2010, pp. 39-53.

Bansard, Jennifer, and Tomilola Akanle Eni-ibukun. "Climate Negotiations Glossary" *International Institute of Sustainable Development*, 2024, https://www.iisd.org/articles/deep-dive/climate-negotiations-glossary

Bennet, Tony. "Introduction: Museums, Knowledge, Power." *Museums, Power, Knowledge*, Routledge, 2018.

Bennett, Tony. "Mutable Immutable Mobiles: Museum Things." *Society + Space*, 11 Mar. 2024, www.societyandspace.org/articles/mutable-immutable-mobiles-museum-things

Biermann, Frank, et al. *Earth System Governance: Science and Implementation Plan*. ESG Project, 2010, https://www.earthsystemgovernance.org/publication/earth-system-governance-science-and-implementation-plan/

Boejie, Hennie. *Analysis in Qualitative Research.* Sage Publications, 2009.

Cole, Alyson. "All of Us Are Vulnerable, But Some Are More Vulnerable than Others: The Political Ambiguity of Vulnerability Studies, An Ambivalent Critique." *Critical Horizons*, vol. 17, no. 2, 2016, pp. 260-270. https://doi.org/10.1080/14409917.2016.1153896

Desikan, Anita, et al. *Abandoned Science, Broken Promises: How the Trump Administration's Neglect of Science Is Leaving Marginalized Communities Further Behind*. Union of Concerned Scientists, 2019. *JSTOR*, http://www.jstor.org/stable/resrep24089

Funtowicz, Silvio, and Jerome Ravetz. "Science for the Post-Normal Age" *Futures*, vol. 25, no. 7, 1993, pp. 739-755. https://doi.org/10.1016/0016-3287(93)90022-L.

Haraway, Donna. “Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective.” *Feminist Studies*, vol. 14, no. 3, 1988, pp. 575-99.

Helmut Pflugfelder, Ehren. *Geoengineering, Persuasion, & the Climate Crisis: A Geologic Rhetoric.* The University of Alabama Press, 2023.

Hofstadter, Douglas. *Gödel, Escher, Bach: An Eternal Golden Braid*. Basic Books, 1999.

Huggett, Jeremy. “Data Legacies, Epistemic Anxieties, and Digital Imaginaries in Archaeology.” *Digital*, vol. 2, no. 2, 2022, pp. 267-295. https://doi.org/10.3390/digital2020016

Intergovernmental Panel on Climate Change. “About the IPCC” *IPCC*, 2025, https://www.ipcc.ch/about/

Intergovernmental Panel on Climate Change. “Annex I Glossary” *Annexes*, IPCC, edited by Andy Reisinger, et al., 2023, https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_AnnexesIndex.pdf

Intergovernmental Panel on Climate Change. *Climate Change 2023: Synthesis Report*. IPCC, Edited by Hoesung Lee et al., 2023, https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_LongerReport.pdf.

Intergovernmental Panel on Climate Change. *Headline Statements*, Intergovernmental Panel on Climate Change, edited by The Core Writing Team, et al., 2023. https://www.ipcc.ch/report/ar6/syr/resources/spm-headline-statements/

Latour, Bruno. *Pandora’s Hope*. Harvard University Press, 1999.

Latour, Bruno. *Science in Action*. Harvard University press, 1987.

Latour, Bruno. "Visualization and Cognition: Drawing Things Together" *Knowledge and Society: Studies in the Sociology of Culture Past and Present*, edited by Henrika Kucklick, Jai Press, 1986, pp. 1-40. http://www.bruno-latour.fr/sites/default/files/21-drawing-things-together-gb.pdf

Law, John. "Making a Mess with Method" *Centere for Science Studies Lancaster University*, 2003, https://www.lancaster.ac.uk/fass/resources/sociology-online-papers/papers/law-making-a-mess-with-method.pdf

Law, John. "STS as Method" *The Handbook of Science and Technology Studies*, edited by Ulrikefelt, et al., The MIT Press, 2017, pp 31-57.

Law, John, and Annemarie Mol. "Introduction." *Complexities: Social Studies of Knowledge Practices*, edited by John Law and Annemarie Mol, Duke University Press, 2002, pp. 1-22.

Leigh Star, Susan. "This is Not a Boundary Object: Reflections on the Origin of a Concept." *Science, Technology, & Human Values*, vol. 35, no. 5, 2010, pp. 601-617. *Sage Journals*, https://doi.org/10.1177/0162243910377624

Leigh Star, Susan, and James R. Griesemer. "Institutional Ecology, 'Translations' and Boundary Objects: Amateurs and Professionals in Berkeley's Museum of Vertebrate Zoology, 1907-39." *Social Studies of Science*, vol. 19, no. 3, 1989, pp. 387—420. *JSTOR*, http://www.jstor.org/stable/285080.

Lorenz, Edward. *The Essence of Chaos*. University of Washington Press, 1993.

Markel, Mike, and Stuart Selber. *Technical Communication*. 12th ed., Bedford/St. Martin's, 2018.

McGee, Michael. “The ‘ideograph’: A Link Between Rhetoric and Ideology.” *Quarterly Journal of Speech*, vol. 66, no. 1, 1980, pp. 1-16 https://doi.org/10.1080/00335638009383499

Milstein, Tema, et al. “Introducing Environmental Communication Pedagogy and Practice” *Environmental Communication Pedagogy and Practice*, edited by Tema Milstein et al., Routledge, 2017, pp. 2-8.

Mol, Annemarie. *The Body Multiple*. Duke University Press, 2003.

Mol, Annemarie, and John Law. “Regions, Networks and Fluids: Anaemia and Social Topology.” *Social Studies of Science*, vol. 24, no. 4, 1994, pp. 641—71. *JSTOR*, http://www.jstor.org/stable/370267

“Open Science at NASA” *NASA*, https://science.nasa.gov/open-science/

Nellis Smith, Anna, and Bethann Garramon Merkle. “Meaning-Making in Science Communication: A Case Study Precision in Word Choice.” *Bulletin Ecological Society of America*, vol. 102, no. 1, 2020, pp 1-6. https://doi.org/10.1002/bes2.1794

Peverini, Paolo. *Latour in the Semiotic: An Inquiry into the Networks of Meaning Turn*. Springer Briefs in Sociology, 2023. https://doi.org/10.1007/978-3-031-57178-7

Ribot, Jesse, et al. “The Causal Structure of Vulnerability: Its Application to Climate Impact Analysis.” *GeoJournal*, vol. 32, no. 2, 1995, pp. 119-122. https://doi.org/10.1007/BF00814058

Saldaña, Johnny. *The Coding Manual for Qualitative Researchers*. 4th ed., Sage Publications, 2021.

Saltelli, Andrea. “What is Post-Normal Science? A Personal Encounter” *Foundations of Science*, vol. 29, 2024, pp. 945-954. https://doi.org/10.1007/s10699-023-09932-x

“Open Science Announcements from Federal Agencies” *Science.gov*, https://open.science.gov/

Simmons, Michele, & Jeffrey Grabill. "Toward a Civic Rhetoric for Technologically and Scientifically Complex Places: Invention, Performance, and Participation." *College Composition and Communication*, Vol. 58, No. 3, 2007, pp. 419-448. http://www.jstor.org/stable/20456953

Smith, John E. "Time, Times, and the 'Right Time'; 'Chronos' and 'Kairos." *The Monist*, vol. 53, no. 1, 1969, pp. 1—13. *JSTOR*, http://www.jstor.org/stable/27902109

Uluak Itchuaqiyaq, Cana. "When the Sound is Frozen: Extracting Climate Data From Inuit Narratives" *Technical Communication for Environmental Action.* Edited by Sean Williams, State University of New York Press, 2023. *Project MUSE*, https://dx.doi.org/10.1353/book.110885.

Union of Concerned Scientists. *Scientific Integrity Losses and Lessons for the 116th Congress: Halting, Suppressing, and Altering Scientific Studies*. Union of Concerned Scientists, 2019. *JSTOR*, http://www.jstor.org/stable/resrep24113

van Dijk, Teun A. "Principles of Critical Discourse Analysis." *Discourse & Society*, vol. 4, no. 2, 1993, pp. 249—83. *JSTOR*, http://www.jstor.org/stable/42888777