FRAMING AND RESPONDING TO SCIENTIFIC UNCERTAINTIES: BIOFUELS AND SYNTHETIC BIOLOGY AT THE CONVENTION ON BIOLOGICAL DIVERSITY

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ABSTRACT: The Convention on Biological Diversity’s (CBD) preamble notes that, where there is a threat of significant biodiversity reduction or loss, a lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize this threat. This “precautionary approach,” as it is generally referred to within the CBD, is frequently invoked in the treaty’s outputs, but its meaning in the context of the CBD is still under debate. This article uses the CBD’s engagement with biofuels and synthetic biology from 2010–2014 to trace how framings of scientific uncertainty are shaping the meaning and role of precaution. Thus, without engaging with the legal or political implications, the CBD is producing a version of precaution that responds to a narrow range of scientific uncertainties and acts as a placeholder in lieu of political agreement.


Scientific uncertainty is a persistent characteristic of many issues under international environmental governance, both in our understanding the current state of the environment and our ability to track the causes and magnitude of harms.1 In international environmental law and policy, a key tool guiding decision making in the face of scientific uncertainty is the precautionary principle/approach.2 Since its debut in international environmental treaties in the mid-1980s, precaution has attracted controversy. A key point of dispute is

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2. The terms principle and approach do not have different legal weight, but politically are often used to indicate different interpretations of the meaning of precaution. Jacqueline Peel, Precaution—A Matter of Principle, Approach, or Process?, 5 MELB. J. INT’L L. 483, 485 (2004).
whether it has achieved the status of a principle of customary international environmental law, making it applicable to all countries at all times.3 But even in the context of treaties that include a version of precaution, the concept still draws attention and controversy, raising questions of its interpretation and implementation.4 For example, the Convention on Biological Diversity (CBD) preamble notes that: “where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat.”5 This “precautionary approach,” as it is generally referred to within the CBD, is frequently invoked in the treaty’s outputs, but rarely with any details of what it might entail. Several decades in, the meaning of precaution is still under debate.

Jacqueline Peel notes that focus on the legal nature of the precautionary principle/approach can “mask” political differences on the significance of risks.6 My paper explores another way that the tool of precaution is shaped without seemingly engaging with its political or even legal implications: through framings of the underlying state of scientific uncertainty. The case discussed is the CBD’s engagement with biofuels and synthetic biology in the context of “New and Emerging Issues.”

This research is based on participant observation of CBD negotiating events from 2010 to 2014, observant participation7 as an intern and a consultant with the CBD Secretariat in 2013 and 2014, document analysis, and semistructured interviews with Secretariat staff, State delegates, and civil society observers. An ethnographic approach to policy and law-making processes can trace narratives and concepts as they are gradually institutionalized into policies and programs that make up a field of governance.8 This can be considered a process of coproduction, by which orderings of nature and society (such as scientific knowledge and governing mechanisms) are produced together and often serve to reinforce each other.9 The concept of coproduction

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3. Countries can avoid obligations from a customary principle of international law by being a “persistent objector” during its development. For debate on the existence of a precautionary principle, see generally INDUR M. GOKLANY, THE PRECAUTIONARY PRINCIPLE: A CRITICAL APPRAISAL OF ENVIRONMENTAL RISK ASSESSMENT (2001); Peel, supra note 2, at 493; Christopher D. Stone, Is There a Precautionary Principle?, 31 ENVTL. L. REP. 10790 (2001).
4. See John S. Applegate, The Taming of the Precautionary Principle, 27 WM. & MARY Envtl. L. & Pol'y Rev. 13 (2002); Peel, supra note 2, at 484.
5. Convention on Biological Diversity, opened for signature June 5, 1992, 1760 U.N.T.S. 79, 144. As this is found in the preamble as opposed to the operative text, it could be argued that this precautionary approach should be used by Parties to interpret their treaty obligations. Thanks to an anonymous reviewer for pointing this out.
6. Peel, supra note 2, at 485.
8. Catherine Conson et al., Capturing the Personal in Politics: Ethnographies of Global Environmental Governance, 14 GLOBAL ENVTL. POL. 21, 28 (2014).
has particular salience at the international level, as globalization and new means of producing and assessing knowledge about a global environment have developed together. Just as dominant ways of knowing are coproduced with systems to govern the known, dominant understanding of uncertainties are coproduced with systems to govern what is not known.

Risk regulation—often separated into the steps of risk assessment and risk management—is a common tool for identifying and managing situations of uncertainty and complexity. Such regulatory systems, as well as mainstream risk management literature, portray risk as “real, actual, objective and measurable.” Identification of risks is considered a purely technical stage, leaving political and cultural considerations to the risk management stage. This approach to understanding and responding to risk is pervasive across institutions. A significant body of social science research, however, has shown how richly variable situations of uncertainty are, and how their identification inevitably incorporates values, politics, and assumptions.

The term scientific uncertainty encompasses a broad range of ways and qualities of not knowing. When categorized by characteristics that impact decision making, relevant categories include: risk, uncertainty, ambiguity, and ignorance. Although the term is often used to encompass many situations of uncertainty, risk only refers to situations in which potential outcomes can be identified and their probabilities attributed. Situations that might allow for such high confidence in both outcomes and probabilities include working under controlled conditions or with well-known factors. Uncertainty describes a situation in which the types and scales of possible harms are understood, but their probabilities are not. For example, we may understand the mechanics of flooding but not be able to confidently predict its occurrence under changing climatic conditions. Ambiguity refers to situations in which, rather than the probability of harm being in question, the meaning of the harm is unclear or contested. Ambiguity is at the heart of controversies around

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11. JACQUELINE PEEL, SCIENCE AND RISK REGULATION IN INTERNATIONAL LAW 82 (2010).
13. Id. at 94; Wynne, supra note 1. See generally JAKOB ARNOLDI, RISK: AN INTRODUCTION (2009).
16. My paper mostly uses “scientific uncertainty” as the broadest category encompassing these different types, and “uncertainty” as one specific type. Ulrike Felt (Rapporteur) et al., Taking European Knowledge Society Seriously, at 36, report to the Science, Economic and Society Directorate, Directorate-General for Research, European Commission (2007); Stirling, Risk, Precaution and Science, supra note 14.
genetically modified food, with disagreements on how best to measure impacts and apply values to guide research and ascribe meaning to results.\textsuperscript{19} In situations of ignorance, not all of the possible impacts can be predicted or even understood; we don’t know what it is we don’t know.\textsuperscript{20} Bovine spongiform encephalopathy is an example where the basic parameters of the crisis were not initially understood.\textsuperscript{21} Separate from these types of scientific uncertainty, indeterminacy is a quality of knowledge that is intrinsically open-ended, embedded in “social, technological and natural systems.”\textsuperscript{22} This paper traces how different actors in CBD discussions have framed knowledge of and scientific uncertainties regarding biofuels and synthetic biology, and how this has shaped when precaution can be applied and what it means.

I. THE CBD AND NEW AND EMERGING ISSUES

The processes of decision making examined here result in “Decisions” by the CBD’s Conference of the Parties (COP). The CBD is widely recognized as a framework agreement in that it (1) gives Parties considerable freedom to determine how to implement its provisions; and (2) explicitly allows the COP to negotiate legally binding protocols.\textsuperscript{23} Outside of a protocol, outcomes of a CBD COP are not generally understood to bind Parties to specific actions. Rather, COP Decisions indicate agreement among the 196 CBD Parties on the boundaries of a given problem, desirable steps towards solutions, and principles to guide collaboration. COP Decisions have the status of soft law—formal, but not legally binding.\textsuperscript{24}

As the first step in developing a COP Decision, the CBD Secretariat drafts a set of Suggested Recommendations for the Subsidiary Body on Scientific, Technical, and Technological Advice (SBSTTA). The SBSTTA, a technical advisory body to the explicitly political COP, agrees on Recommendations that serve as the basis for COP negotiations. These Recommendations are often heavily bracketed, indicating lack of consensus. At the COP, negotiations occur in large Working Group sessions and in smaller meetings of Con-

\begin{itemize}
  \item \textsuperscript{95, 99 (2008)} hereinafter Stirling, Science, Precaution, and the Politics of Technological Risk; Stirling, Risk, Precaution and Science, supra note 14.
  \item \textsuperscript{19} Stirling, Science, Precaution, and the Politics of Technological Risk, supra note 18.
  \item \textsuperscript{20} Wynne, supra note 1; Stirling, Risk, Precaution and Science, supra note 14.
  \item \textsuperscript{21} Stirling, Risk, Precaution and Science, supra note 14, at 311; Steve Hinchliffe, Indeterminacy In-Decisions—Science, Policy and Politics in the BSE (Bovine Spongiform Encephalopathy) Crisis, 26 TRANSACTIONS INST. BRITISH GEOGRAPHERS 182, 192 (2001).
  \item \textsuperscript{22} Felt et al., supra note 16.
  \item \textsuperscript{23} Interview with CBD Secretariat Staff, (Jan.–Mar. 2013) hereinafter CBD Secretariat Interviews (conducted by the author in person at the offices of the CBD Secretariat) (notes on file with author); LYLE GLOWKA, ET AL., A GUIDE TO THE CONVENTION ON BIOLOGICAL DIVERSITY 1–2 (1994).
  \item \textsuperscript{24} They do serve as legally binding interpretations of the CBD Convention text, but are not generally understood to legally bind Parties to specific actions. For more information on soft law, see Pierre-Marie Dupuy, Soft Law and the International Law of the Environment, in INTERNATIONAL ENVIRONMENTAL LAW AND POLICY 349 (David Hunter et al. eds., 2d ed. 2002).}

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tact Groups and Friends of the Chair. The CBD is notable for its openness; other U.N. treaties often operate by closed meetings, either for only Party delegates or just a subset of Parties, but at the CBD formal sessions are almost always open to all Parties and even observers.

In 2006, the CBD COP introduced a new mechanism, New and Emerging Issues (NEI), to allow issues of particular novelty and urgency to be added to the SBSTTA’s agenda. This was not expected to trigger controversy; NEI was seen as formalizing a long-standing practice of introducing issues of relevance to the treaty system. After contentious discussions, SBSTTA 12 identified biofuels as the first NEI in 2007. This began years of negotiations marked by disagreement and often acrimony, as CBD Parties debated how the treaty should respond to biofuels. Although almost all of the possible options for response by the CBD would be legally soft, CBD guidelines could subsequently be incorporated into formal certification processes such as the European Union’s, and thus take on increased importance.

Much of the debate on biofuels at the CBD has revolved around the uncertain impacts of biofuel production and use, such as the role of indirect land-use change (ILUC). ILUC describes displacement effects; biofuel production could cause ILUC if a land use such as pastoralism was displaced for biofuel feedstock, and other land was converted to replace the lost pastoral lands. Taking such indirect impacts into account can significantly impact the total carbon, greenhouse gas (GHG) emissions, and other impacts on biodiversity attributed to any given biofuel project, but calculating ILUC is incredibly challenging. The impacts and extent of ILUC cannot be directly observed, and thus scientists and policy makers are reliant on models, which display a

26. Chairs generally restrict the vocal engagement of observers and non-Parties, but they are usually allowed in the room, and sometimes are granted the opportunity to speak.
28. CBD Secretariat Interviews, supra note 23.
30. As Hunsberger and her coauthors note, because the E.U. Renewable Energy Directive requires a certification of “sustainability” from an approved body, biofuel certification schemes have taken on more importance than perhaps other commodity certification processes. See Carol Hunsberger et al., Livelihood Impacts of Biofuel Crop Production: Implications for Governance, 54 GEOFORUM 248, 251 (2014).
32. NUFFIELD COUNCIL ON BIOETHICS, BIOFUELS: ETHICAL ISSUES xxi (2011); Di Lucia et al., supra note 31, at 10.
broad range of results because of differences in starting assumptions, model design, and resolution.\footnote{33}

Narratives of “next generation” biofuels promise to avoid the social, ecological and economic challenges of conventional biofuels, by providing technologies that will produce fuel from waste and create feedstocks that grow quickly and affordably on marginal lands.\footnote{34} Synthetic biology has been broadly considered a key approach to developing viable next generation biofuels, and was introduced to the CBD biofuels discussions in 2010 at SBSTTA 16. Synthetic biology is often described as “[1] the design and construction of new biological parts, devices, and systems, and [2] the re-design of existing, natural biological systems for useful purposes.”\footnote{35} Critical civil society groups describe synthetic biology as “extreme genetic engineering,” because genetic design and synthesis technologies make possible the production of more novel organisms.\footnote{36} While some argue that the greater precision of synthetic biology tools decrease uncertainties regarding ecological, human health and other impacts,\footnote{37} others argue that synthetic biology opens up new areas of uncertainty.\footnote{38} As a group of policy analysts and ecologists have pointed out: “No one yet understand the risks that synthetic organisms pose to the environment, what kinds of information are needed to support rigorous assessments, or who should collect such data.”\footnote{39}

Since 2010, CBD COP Decisions on biofuels have addressed synthetic biology.\footnote{40} At the same time, the issue has been under ongoing consideration as

\footnote{33. Di Lucia et al., supra note 31, at 11.}
\footnote{34. Simonetta Zarrilli, Development of the Emerging Biofuels Market, in GLOBAL ENERGY GOVERNANCE: THE NEW RULES OF THE GAME 73, 93 (Andreas Goldthau & Jan Martin Witte eds., 2010).}
\footnote{35. Adrian Mackenzie, Synthetic Biology and the Technicity of Biofuels, 44 STUD. HIST. & PHIL. SCI. PART C: STUD. HIST. & PHIL. BIOLOGICAL & BIOMEDICAL SCI. 190, 190 (2013).}
\footnote{36. This definition comes from a website initiated by synthetic biologists at MIT and Harvard. SYNTHETIC BIOLOGY, http://syntheticbiology.org (last visited Apr. 8, 2016). This is just one wording; this general approach to explaining the intentions and approach of synthetic biology in two parts—making new, and redesigning existing—is commonly used when explaining synthetic biology outside of the discipline. For a discussion on the lack of a common definition, see Adam Arkin et al., What’s in a Name? 27 NATURE BIOTECHNOLOGY 1071 (2009) (asking twenty experts to define “synthetic biology”). The definition of synthetic biology (or the lack thereof) has been a significant point of discussion in CBD processes subsequent to those described in the main text of this article. See Convention on Biological Diversity, Rep. of the Ad Hoc Technical Expert Group on Synthetic Biology, U.N. Doc. UNEP/CBD/SYNBIO/AHTEG/2015/1/3, 3–4 (Oct. 7, 2015) [hereinafter Rep. of the AHTEG].}
\footnote{37. FRIENDS OF THE EARTH ET AL., THE PRINCIPLES FOR THE OVERSIGHT OF SYNTHETIC BIOLOGY 2 (2012).}
\footnote{38. See, e.g., Victor de Lorenzo, Environmental Biosafety in the Age of Synthetic Biology: Do We Really Need a Radical New Approach?, 32 BIOESSAYS 926, 929 (2010).}
\footnote{39. See, e.g., Allison A. Snow & Val H. Smith, Genetically Engineered Algae for Biofuels: A Key Role for Ecologists, 62 BIO SCIENCE 765, 765 (2012).}
\footnote{40. Genya V. Dana et al., Four Steps to Avoid a Synthetic-Biology Disaster, 483 NATURE 29, 29 (2012).}
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a stand-alone NEI. Since biofuels were named the first NEI, the CBD COP has elaborated a formal process for identifying NEI, with seven criteria, including: relevance of the issues to the Convention’s objectives; new evidence of unexpected and significant impacts on biodiversity; and urgency. Since the NEI criteria were developed, no substantive issue has been added to the CBD’s agenda through this mechanism.

Parts II–IV describe three instances of the treaty bodies’ engagement with various kinds of uncertainties related to biofuels and synthetic biology. Part V considers the implications of these approaches for the treaty and possible alternatives.

II. BIOFUELS AT COP 10:
NARROWING THE RANGE OF UNCERTAINTIES

The 2010 COP 10 biofuel negotiations were based on the SBSTTA 14 Recommendations, which included numerous bracketed references to scientific uncertainty and the need for precaution. These Recommendations prompted debate on the status of scientific knowledge and contending framings of scientific uncertainties relating to biofuels. Below, I map actors’ descriptions onto the four categories of scientific uncertainty and examine how these different framings corresponded with expressions of the relevance and meaning of precaution.

A. Risk

Numerous delegations to COP 10 framed biofuels as well understood. On the first day of formal negotiations on biofuels, several South American delegations called for deleting reference to scientific uncertainty, because it did not reflect the “reality of scientific knowledge” or the “complexity of the issue.” To support their assertion that biofuels presented no unknowns, the Brazilian delegation argued throughout the negotiations for a narrow scope to the Biofuels Decision. Brazil tried to remove (1) mentions of direct and indi...
rect impacts on land and water use because they are broader than biodiversity;48 (2) biosafety concerns because they are not unique to biofuels;49 and (3) mention of synthetic biology because it is used more broadly than for biofuels.50 By narrowing the issues of concern, areas of uncertainty would be restricted to the predictable impacts of biofuel production—that is, framing biofuels as presenting manageable risks.51 The strongest advocates for a risk framing of biofuels argued that precaution should not be invoked at all in the COP Decision.52 As a businessman on the Brazilian delegation explained at a side event, the impacts of producing sugar in Brazil are “very clear... we don’t need to adopt the precautionary approach or principle to produce sugar-cane.”53

As opposed to the argument that well-understood risks do not require precaution, the E.U. delegation only invoked the need for precaution in the biofuel negotiations where there was scientific evidence of harm. The E.U. delegation insisted that biofuels be mentioned in relation to invasive alien species, and that the precautionary approach be invoked, because there is scientific evidence that biofuel crops have become invasive.54 On the other hand, the E.U. delegation argued against including synthetic biology in the biofuels Decision because there was “not sufficient scientific evidence” to justify its inclusion.55 The need for a strong evidentiary basis for harm seems to restrict the kinds of scientific uncertainty to risk and possibly uncertainty.56

B. Uncertainty

Some delegations framed biofuels as presenting known challenges, but lacking sufficient scientific evidence to allow for prediction and full understanding. For example, Tunisia described information on biofuels’ impacts on biodiversity and socioeconomic conditions as “quite pathetic,” and requiring a scientific evaluation.57 Similarly, Algeria warned that the stakes were high—biofuels could destroy basic systems of production—but they lacked “enough

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49. Id. (Oct. 26, 2010).
50. COP 10, Working Group I, supra note 45; COP 10, Biofuels Contact Group, supra note 48 (Oct. 26, 2010); Ethnographic notes from COP 10, Biofuels Friends of the Chair (Oct. 27, 2010) [hereinafter COP 10, Biofuels Friends of the Chair] (taken by author, Sarah Hitchner, Edward M. Maclin, and Juan Luis Dammert B.) (on file with author).
51. See Stirling, Risk, Precaution and Science, supra note 14, at 311.
52. Brazil and Argentina argued this point at COP 10, Working Group I, supra note 45; COP 10, Biofuels Contact Group, supra note 48 (Oct. 21 & 26, 2010); COP 10, Biofuels Friends of the Chair, supra note 50.
54. The Biofuel Contact Group was tasked with developing a paragraph on biofuels for the Invasive Alien Species Decision. COP 10, Biofuels Contact Group, supra note 48 (Oct. 21, 2010).
55. COP 10, Working Group I, supra note 45.
56. See Stirling, Risk, Precaution and Science, supra note 14; Felt et al., supra note 16, at 64.
57. COP 10, Working Group I, supra note 45.
data to respond to these issues." There was no doubt expressed about the impacts, but frustration about the current lack of data that would prove them. This framing of uncertainty was expressed as gaps in knowledge. The version of precaution offered by these same Parties was a stopgap; they urged a pause in production until the situation was better understood. Algeria phrased it as an “ounce of cure” instead of an infection after.

C. Ambiguity

Few interventions at COP 10 dwelt on the contested meaning of harms posed by biofuels. A representative from U.N. Environment Programme and U.N. Energy came close, noting that biodiversity impacts were difficult to address with the “typical kind of indicators,” and thus the precautionary principle was “critical.” Indeed, as discussed later, methods for measuring or modelling impacts of biofuels on biodiversity, particularly at a large scale, are highly contentious. This representative seemed to imply that, because biodiversity impacts could not be reliably measured, precaution should be applied. She did not describe what this application should look like, but by tying it to the unique challenges of measuring biodiversity impacts, she seemed to be calling for essentially an institutionalization of precaution.

D. Ignorance

Party delegations stressing the unknown aspects of synthetic biology, such as the Africa Group, the Philippines, and Bolivia, argued for a moratorium on the environmental release of organisms produced using synthetic biology. The Philippines delegation often portrayed the state of knowledge of synthetic biology as one of ignorance, noting that there was no scientific certainty on the impacts and that a moratorium could be lifted once there was certainty. The Philippines thus called for acting with precaution until synthetic biology’s impacts were known to be safe. Flipping the burden of proof—demanding proof of safety rather than evidence of specific danger—is one interpretation of the precautionary approach.

Civil society groups intervened throughout the biofuel negotiations to claim a lack of understanding of the impacts of biofuels and, especially, of organisms produced using synthetic biology. As a representative of the Federation of German Scientists argued in a session of the Contact Group, “we do not know how to assess” the organisms modified to enable biofuel pro-

58. Id.
59. As discussed later in relation to ILUC, uncertainty can also be framed as intractable; rather than temporary gaps in knowledge, the inability to determine probabilities can be a core characteristic of the situation. See Stirling, Risk, Precaution and Science, supra note 14. These Parties framed this uncertainty as easily overcome with investment in research.
60. COP 10 Working Group I, supra note 45.
61. Id.
62. COP 10, Biofuels Contact Group, supra note 48 (Oct. 26, 2010).
63. Peel, supra note 2, at 486–87.
64. E.g., COP 10 Working Group I, supra note 45; COP 10, Biofuels Contact Group, supra note 48 (Oct. 26 & 27, 2010).
cessing. These groups did not call for more research to quantify known impacts; they claimed a state of ignorance in how to identify and assess impacts. Their comments verged on describing the impacts of synthetic biology as not just unknown but unknowable.

E. Outcomes of Uncertainty at COP 10

Over the course of COP 10, a range of kinds of scientific uncertainties were raised in relation to the biodiversity-related impacts of biofuels. COP Decision X/37 does not reflect this range. Rather than “acknowledging scientific uncertainty,” the preambular paragraph recognizes “gaps in scientific knowledge and concerns that exist regarding such impacts.” The one explicit call to apply the precautionary approach is “to the introduction and use of living modified organisms for the production of biofuels as well as to the field release of synthetic life, cell, or genome into the environment, acknowledging the entitlement of Parties, in accordance with domestic legislation, to suspend the release of synthetic life, cell, or genome into the environment.” The Decision on Invasive Alien Species also includes a paragraph calling for the application of the precautionary approach in using invasive species as feedstock for biofuels.

With minimal discussion on the precautionary approach, certain versions of precaution were taken off the table by rejecting certain framings of scientific uncertainty. The preambular description of “gaps in knowledge” frames biofuels as knowable, even if not currently known—essentially acknowledging risks and uncertainties, but not the more complex situations of ambiguity and ignorance. It ignores broader difficulties and concerns with identifying and measuring the impacts of biofuels on biodiversity and related socioeconomic impacts. The Decision on Biofuels does not explicitly call for applying precaution to this overall situation—this seems to align with Brazil’s framing of manageable risks falling outside of precaution. On the other hand, the European Union’s framing of precaution applying specifically to proven threats is present in the Decision on Invasive Alien Species.

The Decision on Biofuels restricts the precautionary approach to synthetic biology and living modified organisms, without describing the scientific

65. COP 10, Biofuels Contact Group, supra note 48 (Oct. 26, 2010).
66. Rep. of the Tenth Meeting, supra note 41, at 293.
67. Id. at 296.
68. Id. at 298.
69. “Living modified organisms” is a term of art specific to the CBD that is generally understood to align with the more common term “genetically modified organisms.” The Decision also invites Parties to “take[ ] into account paragraph 3 of Decision IX/2,” which includes the precautionary approach among a list of eleven relevant tools and guidance. Rep. of the Tenth Meeting, supra note 41, at 294. Legally, therefore, Parties are invited to take precaution into account in interpreting the entire Decision X/37, but politically such an oblique mention is understood to downplay this. Throughout the NEI negotiations delegations have fiercely debated whether to use specific language of precaution or merely cite past Decisions using that language. See COP 10, Biofuels Contact Group, supra note 48; Ethnographic notes from COP 11, NEI Friends of the Chair (Oct. 15, 2012) (taken by author) (on file with author); Ethnographic notes from SBSTTA
uncertainties they pose or the meaning of precaution in biofuel production and use. Although suspending environmental release is one possible interpretation, the Decision’s language carefully avoids recommending such action—Parties are entitled to follow their own national legislation should it exist. The need for improved scientific, environmental, and socioeconomic research is recognized, but this is not linked to decision-making choices, as desired by Parties calling for pauses in support or moratoriums. The lack of specificity leaves open the possibility of using precaution to respond to ambiguity and ignorance, but it could also be interpreted as restricted to the aspects of synthetic biology with clear scientific evidence of threats.

If biofuels pose only “gaps” in knowledge, what happens to aspects that fall outside of scientific measurement, monitoring, and ways of knowing? What happens over time if the precautionary approach is invoked without engaging its substantive meaning? Subsequent to COP 10, the CBD has come up against both of these challenges in its engagement with biofuels and synthetic biology.

III. BIOFUELS AFTER COP 10: RESPONDING TO THE CHALLENGE OF INDIRECT LAND-USE CHANGE

Before COP 11, the CBD Secretariat published a technical series paper, *Biofuels and Biodiversity*, which described ILUC as causing known harms but challenging quantification of these harms in terms of “scale and severity.”70 The inability to accurately quantify ILUC impacts is not framed as a temporary challenge, but rather the result of fundamental differences in methodologies and key assumptions.71 Thus, the Secretariat can be seen as describing ILUC as an intractable uncertainty, for which the type of harm is understood, but the scale and probability are fundamentally unknowable.

For the 16th meeting of SBSTTA, the CBD Secretariat prepared suggested text requesting SBSTTA to assess the effectiveness of tools and approaches for strategic environmental assessment of biofuels and integrated land-use planning. This would have required grappling with the uncertainties inherent in these tools. Instead, the “action point” in the 2012 COP 11 Decision requests the Secretariat to “compile information on relevant definitions of relevant key terms.”72

In response, the CBD Secretariat’s 2014 report on definitions included a section on “direct and indirect land use change.”73 Monitoring and managing ILUC is described as “difficult and complex,” and ILUC is a “key issue regarding the sustainability of biofuels production and use with regard to biodi-

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71. Id. at 43.
versity." The Secretariat explains that, because of ILUC, biofuel production cannot be defined as “sustainable” based on site-specific factors, and that models are necessarily required.

At SBSTTA 18, some delegations strenuously argued that the report and its reflections on ILUC were “unbalanced” and “incomplete.” A Brazilian delegate said that the report’s discussion on ILUC failed to acknowledge that models “lack accurate methodology” for “precise results,” and that therefore assessments of ILUC were not only uncertain but also “unobservable, unverifiable, and reliant on assumed economic and social contexts in the modeling.” An Argentinian delegate noted that there was no “international consensus” on ILUC because of the “difficulty in quantifying” it. SBSTTA 18 ultimately requested the Secretariat to revise the document and submit it to further peer review.

ILUC presents a threat that, as Brazil said, is “not something verified nor verifiable.” There is no clear timeline or path by which the attendant uncertainties in measuring or managing ILUC will be resolved. The message from Brazil and Argentina was that the difficulties in quantifying ILUC meant that data on the phenomenon was an unreliable and thus unjustifiable basis for environmental policy.

Social scientists have noted that decision makers often overstate the degree to which scientific uncertainties can be reduced and resolved. This arguably happened at COP 10, as a broad range of uncertainties were described as “gaps in knowledge.” In the case of ILUC, however, its complexity was not reframed as something simpler. Instead, Parties essentially argued that the issue could be not addressed because it was indeterminate, inextricably entwined with its context. Brazil and Argentina framed such indeterminate uncertainties as illegible to the CBD, and thus not requiring a response from the treaty bodies.

IV. SYNTHETIC BIOLOGY AFTER COP 10: APPLYING NEI CRITERIA IN THE ABSENCE OF EVIDENCE

Since the 2010 COP 10, CBD bodies have been actively considering whether to add synthetic biology as an NEI to the agenda of the CBD, but have

74. Id. at 4.
75. Id.
76. SBSTTA 18, Plenary (Brazil & Argentina), supra note 69.
77. Id.
78. Id.
80. SBSTTA 18, Plenary, supra note 69.
82. Felt et al., supra note 16, at 36.
83. See generally, JAMES SCOTT, SEEING LIKE A STATE (1998) (discussing the concept of State legibility and governability).
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not yet made a decision. When Parties submitted only a handful of documents, the next COP allowed the Secretariat to take a more active role. Decision XI/11 requested the Secretariat to “compile and synthesize relevant available information” of synthetic biology and its potential impacts on the conservation and sustainable use of biodiversity and associated social, economic and cultural considerations, and to analyse how the NEI criteria applied.84 Thus, synthetic biology became the first issue to which the Secretariat was asked to explicitly apply the NEI criteria.85

As the consultant responsible for drafting this document, I encountered several layers of ambiguity. It was an open question whether each criterion needed to be met to qualify as an NEI. At the 2012 negotiations, delegations seemed to generally share the assumption that synthetic biology would not meet criterion (b): “new evidence of significant impacts on biodiversity,” but disagreed on what this meant. Some delegations insisted this meant that synthetic biology did not meet the standard of an NEI,86 while others countered that Decision IX/29 could be interpreted as not requiring each criterion, or even that Parties had the political power to change the criteria.87 The COP 11 Decision provided no guidance on this, simply requesting the Secretariat to “apply” the criteria.

Furthermore, applying the criteria was not a straightforward task. The simple answer to criterion (b) is that there is not new evidence of significant impacts of synthetic biology on biodiversity.88 Most research was not at the stage of commercialization, and the impacts of products that had been commercialized were not systematically tracked. But what meaning should be attributed to this lack of evidence? Did it highlight the lack of research investigating ecological impacts of organisms and products of synthetic biology, or associated socioeconomic impacts? Did it raise questions of the timing of the CBD’s engagement with emerging issues? Or did it simply mean that, for the purposes of the CBD, synthetic biology was of no concern?

The Secretariat document applying the criteria did not attempt to answer these questions or the overall question of whether the criteria had been “met.” Rather, it pointed to how the compiled evidence spoke to the criteria and some of the ways this could be interpreted.89 At the June 2014 SBSTTA 18 meeting, delegations repeatedly clashed over different interpretations of the criteria and their application. The Brazilian delegation described knowledge on synthetic biology

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84. Rep. of the Eleventh Meeting, supra note 41, at 141.
85. As of May 2016, this is still the only instance of explicit application of the NEI criteria.
86. COP 11, NEI Friends of the Chair (European Union, Canada, & New Zealand), supra note 69.
87. Id. (Philippines & Ghana for the Africa Group).
89. Rep. of the Eighteenth Meeting, supra note 79, at 123 (SBSTTA Recommendation XVIII/7).
biology as “incipient” and “not mature enough” to be taken up as an NEI.90 Canada did not believe the “state of knowledge is sufficient” to determine whether synthetic biology was an NEI.91 Delegations such as the European Union, Austria, and Bolivia countered that the Secretariat’s analysis showed that the criteria were met.92 Some delegations simply stated that synthetic biology was an NEI, without referencing the criteria.93

The SBSTTA 18 Recommendation on NEI concluded that there was “currently insufficient information available to finalize an analysis, using the criteria set out in paragraph 12 of Decision IX/29, to decide whether or not this is a new and emerging issue,” and “awaits the completion of a robust analysis.”94 The Mexican delegate voiced the apparently shared expectation that the results of this future analysis would “say whether (synthetic biology) is emerging or not!”95

There was consensus at SBSTTA 18 that the COP should urge Parties to “take a precautionary approach,” but no agreement on what this entailed.96 The CBD’s engagement with synthetic biology overall displays treatment of the precautionary approach as a boundary object. Boundary objects are concepts “plastic enough to adapt to local needs . . . yet robust enough to maintain a common identity.”97 While this flexibility allows delegates to agree on text despite a lack of consensus, it can also facilitate avoidance of differences, deferring conflict.98 In this case, when Parties were confronted with a lack of scientific evidence—a situation that might call for actually applying precaution and not merely invoking it—Parties chose to delay decision making in the hope that a technical process, rather than a political one, would provide answers.

V. MOVING FORWARD:
SCIENTIFIC UNCERTAINTIES AT THE CBD

Disagreements among CBD Parties on biofuels and synthetic biology are based on more than different approaches to scientific uncertainties; these issues raise geopolitical tensions, different approaches to development, and even military considerations.99 However, in the context of the CBD, these disagree-

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90. SBSTTA 18, Plenary, supra note 69 (June 24, 2014).
91. Id.
92. Id.; Ethnographic notes from SBSTTA 18, NEI Contact Group (June 26, 2014) [hereinafter SBSTTA 18, NEI Contact Group] (Bolivia) (taken by author) (on file with author).
93. SBSTTA 18, Plenary, supra note 69 (June 24, 2014) (Egypt, Costa Rica, & Zambia for the Africa Group).
95. SBSTTA 18, NEI Contact Group, supra note 92.
99. See NUFFIELD COUNCIL, supra note 32, at xix, xxiii; Dana et al., supra note 40.
ments have been primarily expressed as disputes over science, certainty, and responses to a lack of certainty. While the CBD’s engagement has not resulted in concrete guidelines for biofuel production or synthetic biology research or application, it has been productive nonetheless—most notably, it has produced a particular version of the precautionary approach that responds to a narrow range of scientific uncertainties and acts as a placeholder in lieu of political agreement.

Shackley and Wynne’s research has shown that collapsing a broad range of types of scientific uncertainty into undifferentiated risk can reinforce existing institutional arrangements. My article demonstrates another result: hemming in the triggers for a precautionary approach to decision making. If precaution is not appropriate for issues such as ILUC, representing indeterminacy and intractable uncertainties, but also not necessary for well-understood situations with clear parameters, then when is a precautionary approach to be taken? Are situations of ambiguity and ignorance thus simply illegible to decision-making processes?

Moreover, as the types of situations seen as calling for precaution narrow, CBD Parties continue to avoid providing substantive meaning to a call for precaution. This approach has kept negotiations from being bogged down in debate on the precautionary principle/approach, and has kept open a range of possible interpretations of precaution. But it has also meant that there is still minimal guidance from the CBD on what a precautionary approach to synthetic biology could entail. And, as demonstrated by the SBSTTA delegates’ handling of a decision that needed to be made in the face of scientific uncertainty, it has effectively taken a key tool for decision making off the table for the treaty bodies.

Debates on synthetic biology have been described as proactionary versus precautionary. This can be caricatured as “full speed ahead” versus “stop everything until safety is proven.” Taking a precautionary approach, however, does not only mean requiring moratoriums. Precaution can mean including questions in an assessment such as who benefits from the proposed action and who stands to bear the costs; what degree of control potentially affected communities have; what indirect effects may exist; what are divergent scientific perspectives; and what alternatives exist.

After the events covered in my paper, the CBD COP 12 established an Ad Hoc Technical Expert Group (AHTEG) on Synthetic Biology. Through this AHTEG and an associated open-ended online forum, different kinds of actors

102. NUFFIELD COUNCIL, supra note 81, at 71; Peel, supra note 2, at 497; Stirling, Risk, Precaution and Science, supra note 14, at 313.
have been brought together to deliberate on questions of what synthetic biology is, what it could be, and how it can be governed. If the terms for the AHTEG are extended (an anticipated outcome of COP 13), this dynamic institutional mechanism could be used to ask debate-broadening questions—of ownership, control, unintended consequences, and alternatives—that a precautionary approach can entail. This could be a site for the CBD to experiment with new strategies for decision making in the face of scientific uncertainties.

Emerging technosciences increasingly challenge our predictive abilities; the complexities of the global environment seemingly multiply the more knowledge we gain. The CBD could chart a path forward for environmental governance in this “postpredictive paradigm.” But this will require the treaty bodies to acknowledge the full range of scientific uncertainties facing us and allow their own decision making to be guided by a precautionary approach.