



Comparing clubs: Analyzing ambitions in the G7 and the G20

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ABSTRACT

Mini-lateral ‘clubs’ occupy an increasingly prominent place in the international environmental governance landscape. Yet few studies have looked at how differences between clubs influence the results they produce. This paper aims to fill this gap in understanding by testing hypotheses on how different clubs’ membership constellations and leadership (connected to large events) affect ambitions in outcome documents of the G7 and the G20. It tests those hypotheses by employing text and data analytic techniques to compare stated ambitions in environmental documents of G7 and G20 over the past two decades. The analysis reveals that the G7’s language is generally stronger than the G20; and that strategic leadership connected to large events may contribute to raising those ambitions. These findings highlight the importance of mini-lateral clubs as forms of environmental governance and, more generally, illustrates the use of text mining in environmental governance research.

1. Introduction

Over the past decades, global multilateral institutions have struggled to generate ambitious environmental agreements. These struggles have led some to lament the “waste of effort” invested in the multilateral system that has been unable to effectively address climate and other planetary crises (Hovi et al., 2013; Kellenberg and Levinson, 2014). Others have similarly argued that these struggles are rooted in collective action problems and risks of free-riding (Nordhaus, 2015). This disappointing performance has led to recommendations that that smaller mini-lateral clubs may increase incentives and lower barriers to arriving at agreements on global commons issues (Antholis and Talbott, 2011; Giddens, 2011).

While claims that clubs can outperform larger multilateral processes merit attention, few studies have compared how real-world variations between clubs affect their performance. Differences between clubs may warrant attention because smaller, homogenous groups find arriving at agreements easier than larger, heterogenous groups (Olson, 1971). Analyzing interclub differences may also prove useful because clubs generate immaterial benefits and support learning processes that become more powerful with closer relationships between members (Unger et al., 2020; Unger and Thielges, 2021). A growing need exists to compare how features of clubs such as their *membership constellations* and *leadership connected to large events* affect stated ambitions in agreements.

The Group of 7 (G7) and the Group of 20 (G20) offer an opportunity to examine how *member constellations* and *leadership connected to large events* influence ambitions in environmental documents. Research on this theme is not only needed but timely (Sobel, 2021). The G7’s establishment of a ‘climate club’ in late 2022 underlines a willingness to deploy smaller groups to address pressing environmental issues (Germany, 2022; Jordans, 2022). Yet, as suggested by the failure to agree upon an environmental communiqué in the recently completed G20 meeting in Indonesia (Lamb and Yuddy Cahya, 2022), bridging views in even slightly larger and more diverse groups (G7 versus the G20) may prove comparatively more difficult (Sobel, 2021).

This article therefore assesses how the differences in clubs’ member constellations and leadership connected to large events influence the ambitions of across G7 and G20 environmental documents. Methodologically, the article employs a semi-inductive approach, involving a back-and-forth between observations from actual policymaking processes and key theoretical concepts. In its empirical analysis, it employs text mining techniques to compare the strengths in language in two decades of environment documents from the G7 and G20. The article shows that, on average, the G7 agrees to stronger language than the G20. The article also demonstrates that leadership connected to large events can increase ambition in key documents.

The conclusions contribute to work on environmental governance as well as research methods. For environmental governance, the results

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suggest that interclub differences in the size and diversity as well as leadership can influence the strength of language. For research methods, the article illustrates the usefulness of text mining techniques to reveal differences and trends in ambitions.

The remainder of the article is divided into five sections. The next section reviews relevant literature on club governance in general and the G7 and G20 in particular. The third section presents hypotheses and methods to test those hypotheses. The fourth section outlines why the G7 and G20 are good cases to test the hypotheses. The fifth section presents the results. The final section concludes with a discussion of policy implications and areas for further research.

2. Literature review: club theory and applications

2.1. Differences between clubs

The early work on “clubs” dates back several decades when economists explored optimal benefit and burden sharing arrangements for the provision of public goods (Buchanan, 1965). In the years following that initial interest, studies would begin to synthesize a growing economics literature on the factors influencing the effectiveness of clubs. One of the more useful such overview studies noted that these factors ranged from those internal to clubs such as institutional form, the costs of excluding participation, and varying characteristics of members as well as external factors such as whether unsatisfied members could join alternative groups (Sandler and Tschirhart, 1980).

In more recent years, studies have considered how similar internal and external factors affect how clubs manage climate and other environmental crises (Brenton, 2013; Eckersley, 2012; Naím, 2009; Victor, 2006). One of the more influential articles from Nordhaus theorizes that the effectiveness and stability of a climate club hinges on monetary penalties or costs for non-participants (i.e. import tariffs) (Nordhaus, 2015). Some have subsequently noted that this ‘Nordhaus club’ is distinguished by small, exclusive groups of like-minded actors that grant members large economic benefits and punish non-compliance. Such groups have also been referred to as transformational clubs that could, in principle, achieve the most ambitious outcomes (Falkner, 2016).

Transformational clubs may have the greatest theoretical potential to deliver environmental public goods. However, very few clubs qualify for the ‘transformational’ category. Instead, another more common subset of clubs may also generate tangible results. For example, a second category of clubs consists of large voluntary, loose and inclusive alliances known as ‘pseudo clubs’ (Green, 2017) or ‘normative clubs’ (Falkner, 2016). Further, a critical real-world set of alliances or clubs exists between the transformational and normative extremes. Falkner (2016) labels that intermediary reality ‘bargaining clubs.’ This third bargaining group consists of clubs such as the G7 and G20 that build a consensus over targets, measures, and rules among a small(er) number of members, resulting in “... agreement amongst the most powerful, rather than the most ambitious” (Falkner, 2016).

This third bargaining category is consistent with arguments that clubs need *not* deliver direct monetary benefits and impose penalties to generate useful outcomes as argued by Nordhaus. Rather this subset of clubs can offer immaterial benefits (i.e. learning good practices) that help build trust and pave the way for different forms of cooperation (Unger et al., 2020; Unger and Thielges, 2021). In so doing, bargaining clubs (and normative clubs) may initially achieve lowest-common-denominator agreements and frame broader objectives around problems they aspire to resolve.

Such bargaining clubs may be smaller and vary in their makeup and results. Further, variations in the size and diversity of their membership, leadership, and other internal and external factors may also be related to their performance. Yet few studies have examined whether and how variables such as a club size and membership as well as leadership (linked to external factors such as large events) relate to dimensions of performance. This area of inquiry merits attention because work on

governance architectures has outlined different metrics to gauge performance on clubs and larger processes, including speed, potential participation, equity, and, most relevant to this study, ambition (Biermann et al., 2009).

2.2. Membership constellation and leadership

A key set of internal factors in the clubs and environmental governance literature that may influence their performance is their *membership constellation* (Unger et al., 2020; Unger and Thielges, 2021). In this article, the term membership constellation will be used to capture both the size and diversity of club members. In using this term, the article acknowledges that cases exist with *small and diverse* memberships. For instance, the three-member tripartite environmental ministers meeting between China, Japan and South Korea is arguably smaller and more diverse than the European Union. There is also some recognition in the international relations literature that size and membership are not the same (Gray et al., 2017). While the possibility of small and diverse groups will be discussed later in the article, at this juncture the article follows assumptions in much of the work on clubs suggesting a strong correlation between the size and diversity of membership (Unger and Thielges, 2021; Falkner, 2016).

Further, much of that literature underlines that the size and diversity could have similar effects on club performance. For example, a commonly held view that often focuses on club size notes that smaller groups find consensus building easier due to higher bargaining efficiency (Falkner, 2016; Olson, 1971). Other authors have concentrated more attention to the diversity of members. For instance, some argue that groups with members that are similar in economic power and policy priorities arrive more easily at agreements (Abbott et al., 2015).

A complementary observation is varying effects of different membership constellations: smaller, homogenous groups generate “narrow-but-deep” outcomes than larger, heterogeneous groups (Weischer et al., 2012:178). Echoing a similar logic, Eckersley (2012) highlights tensions between multilateral universal climate processes (i.e. UNFCCC) that maintain *procedural* justice but make less progress and deliver less *substantive* justice than smaller mini-lateral processes covering major emitters. The lack of progress is arguably due to issue complexity as well as larger number of diverse interests (Keohane and Victor, 2016). Victor (2006) takes this claim a step further, suggesting that a small initially productive group can build momentum for widespread cooperation down the line. Yet, it merits noting that some small groups or clubs can also work to lower ambitions or block the formation of a larger group consensus.

A variable not featured in club literature but that could influence performance is *leadership* (Andresen, 2007; Gupta and Rings, 2001; Kirton and Kokotsis, 2015; Vogler and Stephan, 2007). For instance, “intellectual leadership” (i.e. shaping and steering the agenda) can help countries reconcile interests and affect the likelihood of consensus (Young, 1991). For some, leadership stems from factors within countries such as capacity and will and this leadership can entice others to follow (Busby and Urpelainen., 2020; Sprinz et al., 2018). Such leadership is not always good for the environment. Sprinz et al. (2018) show that sometimes countries with strong leaders and capacities such as the United States under President Trump undermined G7 environmental cooperation in times where leadership was needed.

Yet a final set of considerations involves what might prompt countries to become leaders. For instance, some have pointed to large or mega-events (such as the Olympics) that can motivate countries to raise ambitions on environmental issues (Collins and Flynn, 2008; Shen and Ahlers, 2019). Thus, a country may take up a leading role in pushing for a certain environmental outcome to increase their visibility and capture other reputational benefits. These additional benefits may, in turn, heighten incentives to lead and produce stronger outcomes.

The above research implies that 1) a smaller and less diverse membership constellation and 2) leadership that is connected to large events

Table 1
Comparing members in the G7 and G20.

	G7/8	G20
Number of Members	7/8	20
Standard Deviation in Per Capita GDP (2020)	7597 USD (2020)	17,251 USD (2020)
Standard Deviation in Democratization Index (2020)	0.52	2.17

<https://databank.worldbank.org/source/world-development-indicators>.

Economist Intelligence Unit, Democracy Index 2022, Frontline democracy and the battle for Ukraine (2023) ¹.

Source: The World Bank, *World Development Indicators* (2023)

Table 2
Hypotheses and empirical expectations.

Hypotheses	Empirical Expectations
Membership constellation: The smaller and less diverse the club, the higher its ambitions.	G7 documents will contain more ambitious language than G20 documents.
Leadership connected to large events: Strategic leadership and associated major events raise ambitions.	The commitments contained in G7 and G20 outcome documents will be greater when presidency countries become motivated by concurrent large events to raise ambitions.

may yield more ambitious environmental agreements. The following section provides an overview of research and development in the G7 and G20 to set the stage for empirically testing claims in the clubs and environmental governance literature.

3. The G7 and the G20

The G7 and G20 are good cases for comparing how varying membership constellations and leaders affect the ambitions of clubs. The G7 is an alliance that emerged to facilitate cooperation on global economic and energy issues in 1976. It consists of Germany, the United Kingdom, France, the United States, Italy, Canada and Japan (the European Union is a 'non-enumerated member' while Russia became a member of an expanded G8 but was suspended in 2014 after annexing Crimea). The G20 was formed in 1999 in response to concerns that managing contagions like the late-1990s Asian and Mexican economic crises required engaging more countries. It consists of Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Turkey, the United Kingdom, the United States, and the European Union (Spain is a permanent G20 guest). As shown in the data in Table 1, the G7 not only has fewer members but its members are more similar in levels of economic development and democratization than the G20.

Though the G7 and G20 differ in size and membership, they have both gradually moved from a chiefly economic focus to working on environmental issues. Their discussions on the environment and other themes result in communiqués and other documents that are not legally binding but have potentially symbolic significant meaning that could signal a willingness to take a more ambitious approach to planetary challenges.

Research on G20 and G7 have offered insights that cannot only help track variations in that approach but also underline factors that might be behind it. The most notable set of studies comes from the G8 Research Group and G20 Research Group at the John Graham Library at Trinity College in the University of Toronto. This project has shown that G7 countries attain stronger *national level* compliance with agreements than G20 countries. This research has also devised schemes that can classify

variations in the levels of commitments that can help assess ambition levels in different G7 and G20 outcomes (G20 Research Group, 2020).

Another stream of work has concentrated on membership in G7 (and possibly the G20) influence cooperation (Kirtton and Kokotsis, 2015). This work implies the G7 may have more ambitious outcome documents on environment than G20 because it has fewer actors (Jordans, 2022). Though the G7 may arrive at a consensus more easily, its outcomes may carry less weight if agreements leave out critical actors.

Yet an additional line of work relating to this study involves the role of leadership in G7 and G20. In this context, some have argued that the annually rotating G20 presidency has a strong influence on what the process achieves (Die Bundesregierung, 2016; Westphal and Röhrkasten, 2020). To illustrate, India's officials were urged to make the most of its G20 presidency because of the powers it could wield in this position (Mathur, 2019). These powers include influencing the agenda and 'soft steering' of discussions (Van de Graaf and Westphal, 2011) that has influenced everything from language in Paris Agreement negotiations (Kirtton and Kokotsis, 2015) to provisions for the Green Climate Fund (Vener et al., 2019). Yet, to reiterate a point from the previous section, an unsupportive leadership can also lower ambitions such as when the United States weakened climate outcomes in the G7 and the G20 (Brandt, 2019).

In sum, there is rich empirical ground to examine whether even modest differences in clubs' membership constellations and leadership may yield varying results. The next section outlines and set of hypotheses to test that claim.

4. Hypotheses, data, and methods

Based on the clubs and G7/8 and G20 literature, the article will test the two hypotheses in Table 2; the related empirical expectations are listed in the same table.

The main dependent variable used to test these hypotheses is the ambition of language in key documents. Ambition is used with growing frequency in climate and other policy discussions (UNDP and UNFCCC, 2019). There is, however, no universally agreed definition for the term. This article follows studies that use ambition to imply the stringency or intensity of stated intentions that could potentially lead to improvements in the environment. It also follows those same articles in suggesting that it is possible to assess stringency by creating an ambition scale or index based on language in policy statements (Burns et al., 2020).

Text mining is the main method used to create that scale or ambition index. Text mining entails evaluating texts to infer broader meanings and intentions that might otherwise be concealed in *prima facie* readings of relevant documents. Though not free of limitations, the approach has

¹ Note: The standard deviation figures for the per capita GDP and democratization index are intended to offer a simple illustration of the variation in development levels and political systems between the G7 and G20. A larger standard deviation suggests that there is greater variation in both of those areas in the G20 than the G7. The figures are taken for the year 2020 but would show similar results for other years, although the variation might be marginally greater when Russia was part of the G8.

Table 3
Coding of ambition levels.

Strong commitment	Soft commitment	Acknowledgement/Agenda setting
1. affirm	1. promote	1. important
2. commit	2. support	2. acknowledge
3. will	3. welcome	3. stress
4. adopt	4. encourage	4. note
5. establish	5. continue	5. underline
6. aim	6. consider	6. highlight
7. resolve	7. look	7. call (upon, for)
8. endorse	8. recognize	8. invite
9. reiterate	9. emphasis	9. urge

Table 4
Hypotheses and methods.

Hypotheses	Methods
Membership constellation: The smaller and less diverse the club, the higher its ambitions.	1. Comparison of key terms belonging to three ambition categories expressed as total both the total scores and percentage of the entire corpus of text for G7 and G20. 2. Comparison of composite ambition scores for documents related to G7 and G20. Composite scores have three scales (1:2:3/1:2:4/1:3:9). 3. Comparison of key terms belonging to three ambition categories related to five common themes for G7 and G20: 1) climate and energy; 2) biodiversity and land use; 3) circular economy, sustainable consumption and production, the 3Rs; 4) oceans and marine litter; and 5) others.
Leadership connected to large events: Strategic leadership and associated major events raise ambitions.	1. Comparison of trends in composite “ambition scores” in documents over time and across G7 and G20. Composite scores have one scale (1:2:3) with UK and Japan marked. 2. Six multivariate regressions using composite ambition scores with three scales and dummy variables for the G7 and G20 as well as UK and Japan.

been employed to distil political positions of key actors (Garry and Laver, 2000); assess inter-linkages and trade-offs among policy objectives (Zhou and Moinuddin, 2017); evaluate styles of governance on SDG Action Plans (Meuleman and Niestroy, 2015; Olsen et al., 2021); analyze international trade agreements (Seiermann, 2018); and evaluate climate agreements (Castro, 2020). Most of the text mining employed herein involves combining two approaches: 1) text frequency; and 2) a variant of sentiment analysis.

The first technique, text frequency, entails counting the frequency of terms in a given document or corpus of documents. In most of this article, the text frequency is then translated into percentages by dividing frequencies of key “ambition” terms by the overall word count for each document. The use of percentages as opposed to raw word counts is chosen because some documents may vary in length and only relying on total number of terms would unduly discount the ambition in such shorter documents.

The second technique, sentiment analysis, refers to assigning a value to key terms that would demonstrate the overall ‘sentiment’ within a document or corpus. Sentiment analysis is often used to assess whether the tone of a document is positive or negative. It frequently does this by working with an existing dictionary of key terms that are associated with a given connotation (Silge and Robinson, 2022). The terms are then weighed based on how much they reflect a given sentiment.

To support the sentiment analysis, the authors developed a context-appropriate dictionary of key terms and associated scoring system for ambition. The creation of dictionary specific to this article was needed because there has been limited applications of text analysis to this field. But rather than start from scratch in the developing the dictionary, the article drew upon typology used by the aforementioned G8 Research Group and G20 Research Group at the John Graham Library at Trinity College in the University of Toronto to compare national compliance with commitments as well as repeated readings of the text. Yet, whereas the University of Toronto distinguishes between (i) Commitment; (ii) Sometimes; and (iii) No Commitment (G20 Research Group, 2020), the article classified words as belonging to three different ambition categories listed in Table 2: (i) strong commitment; (ii) soft commitment; (iii) acknowledgement/agenda setting.

The decision to use the terms in Table 3 was based on two related considerations. First, there was already an extensive amount of work

using comparable terms to examine concepts similar to ambition in the G7 and G20. Having this foundation in place made it less likely that there would be problems with tests and inferences drawn from this work. The second consideration is that the G8 Research Group and G20 Research Group’s work has also suggested a correlation between commitments of the club and national compliance. The link between stronger language and compliance will be discussed in greater depth in the conclusion of the paper.

The above techniques were used with two samples covering longer and shorter timeframes. For the longer timeframe, the article relied on a corpus of 54 environment-related documents from the G7 and G20 over the period of 2001 and 2021. Those documents spanned a vast and varied thematic landscape. In some cases, there were close parallels between the time and themes covered in a G7 and G20 documents. In others, the themes were distinct—for example, the G7 took up the reduce, reuse, recycle (3Rs) before the G20. However, since the sample was comparable in size (27 G20 documents and 27 G7 documents) concerns about direct comparisons in themes may be less problematic than if the comparison was conducted on a smaller collection of documents.²

In addition, the article also examined two sets of environmental documents over a shorter time frame to add a comparative perspective to the study. For that closer look, the study looked at 2019 and 2021 for the G7 and G20 across the following common themes: 1) energy and climate change; 2) biodiversity; 3) oceans and plastic; 4) circularity, sustainable consumption and production, and 3Rs; and 5) other.

Before reporting results, it should be clarified which data and methods are used to test which hypotheses. For H1, the analysis spanning the 54 documents was initially used for testing the hypothesis. The test was then run for similar themes across a shorter time-frame for a smaller number of documents. For the H2, a large-n regression analysis compared the effect of a number of selected presidencies (UK and Japan) with variables that also controlled for G7 and G20. The methods are summarized in Table 4.

² See Annex for a table of reviewed documents.

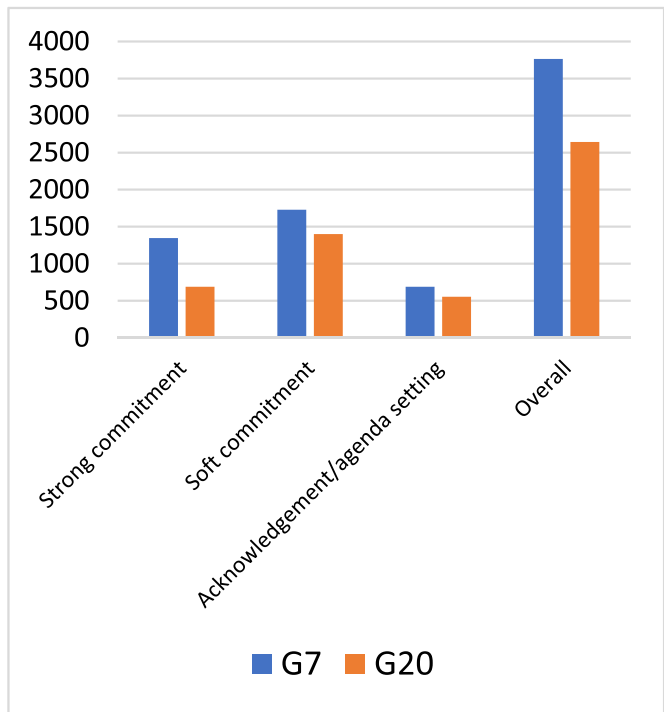


Fig. 1a. Comparing total number of ambition terms between G7 and G20.

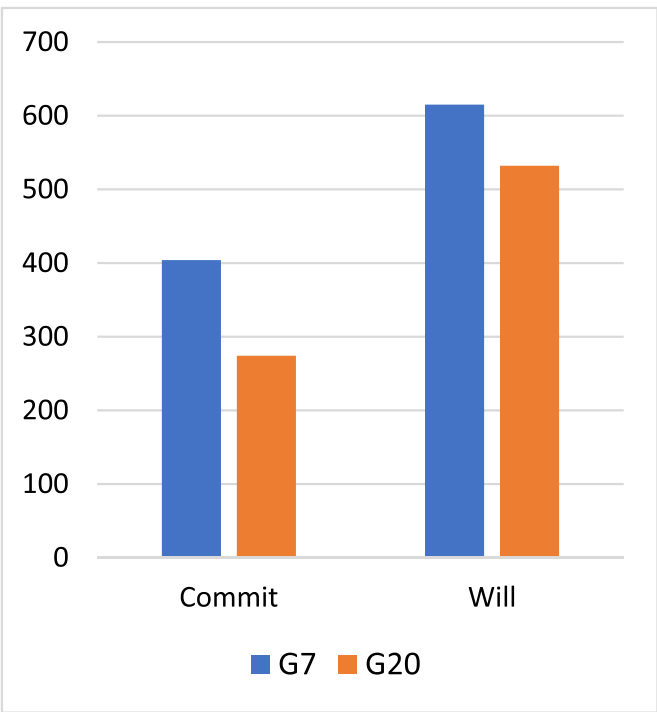


Fig. 2a. Comparing total number of references to "Commit" and "Will" between G7 and G20.

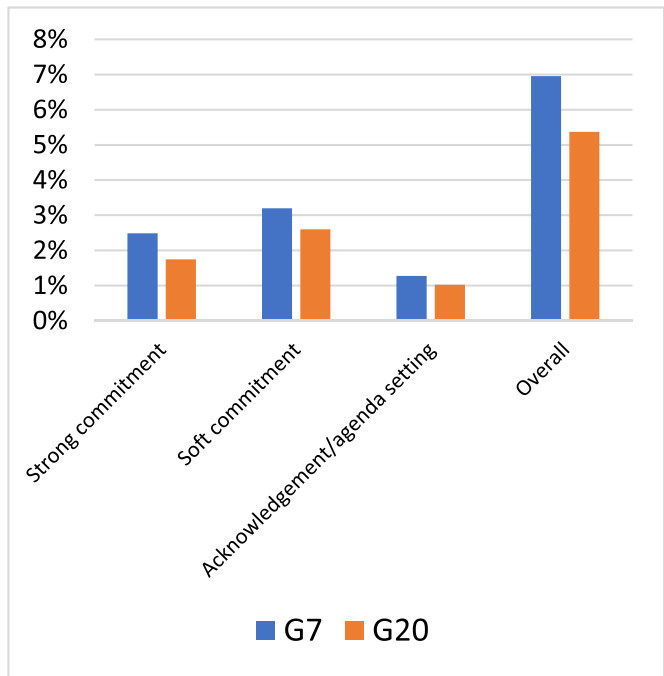


Fig. 1b. Comparing percentage of ambition terms between G7 and G20.

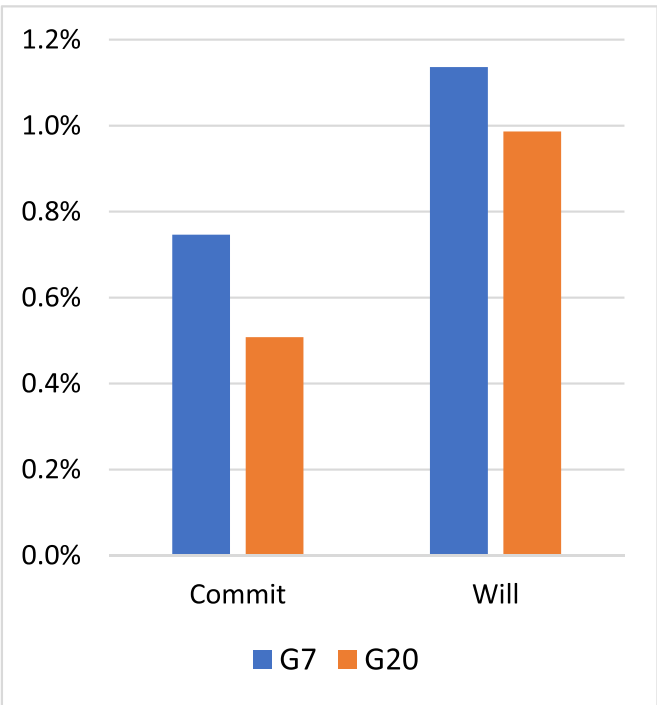


Fig. 2b. Comparing percentage of references to "Commit" and "Will" between G7 and G20.

5. Results

The section presents the results of the hypotheses testing. Each subsection that follows begins with the two hypotheses and follows with a summary of results.

5.1. The smaller and less diverse the club, the higher its ambitions

The first hypothesis anticipates that the G7 arrives at more ambitious language than the G20. There is support for this claim.

The first piece of supportive evidence is presented in Figs. 1a and 1b. Fig. 1a illustrates the number of words belonging to the three ambition categories. Fig. 1b does the same for percentage of those words (divided by the total words for the G7 and G20 corpus) to demonstrate the differences are not simply an artifact of the total number of words. The two figures appear similar because the total number of words for the G7 and G20 corpus are roughly the same (G7 = 54,135 and G20 = 53,932).

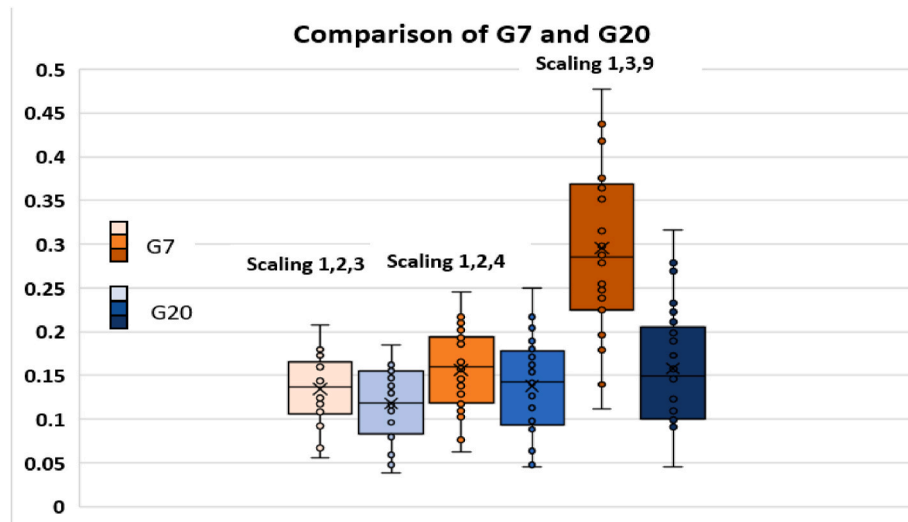


Fig. 3. Comparing composite ambition scores in G7 and G20 documents.

Figs. 1a and 1b suggest that for all of the three categories, there is a difference in the total count and percentage of terms between the G7 and G20. Importantly, the difference is greatest between the most ambitious “strong commitment” category (the G7 approximately is about 30% greater than the G20). Figs. 2a and 2b, which looks at specific terms within the strong and soft commitment categories, tells a similar story. Fig. 2 shows both the total number and percentage of terms is greater for key words “commit” and “will” under the G7 than the G20.

To offer another view on whether evidence supports the first hypotheses, the article also compared the G7 and G20 across three types of cumulative ambition scores. These scores were developed by taking the three categories: strong commitment, soft commitment, acknowledgement/agenda setting and multiplying the percentages of words for each document by three scales based on the aforementioned sentiment analysis: Scale 1=(3,2,1); Scale 2=(4,2,1); and Scale 3=(9,3,1). These three scales were selected because they reflect the possibility that differences in the strength of words in the categories can be one, two or three times greater than each other.

Again, as suggested in the box and whiskers plots in Fig. 3, there is support for the claim that the G7 has stronger language than the G20. The differences in the means between the G7 and G20 range from

approximately 14%–48%. A simple *t*-test suggests that differences between the G7 and G20 samples are statistically significant at the 0.1 level for the first two scales and at the 0.06 level for the last scale. It is therefore unlikely that these between group differences are due to random chance.

The claim that the G7 documents achieve higher levels of ambition also finds support from a more comparable set of documents. This was done by examining only the main G7 and G20 environmental outcome documents that cover five similar themes from 2019 to 2021: 1) climate and energy; 2) biodiversity and land use; 3) circular economy/sustainable consumption and production, the 3Rs; 4) oceans and marine litter; and 5) others. Fig. 3 cumulatively stacks the occurrence of words in those five themes. It merits noting the five themes were compared across the two clubs’ outcome documents and were counted following the same approach as described for the sentiment analysis with two modest modifications. The first modification is the number of occurring commitment terms was not divided by the total number of words in the document or the section of the document on that theme. This was done because some subsections were very short. In the short sections the occurrence of even one word could significantly change ambition scores.

Fig. 4 demonstrates the relatively greater cumulative strength of the

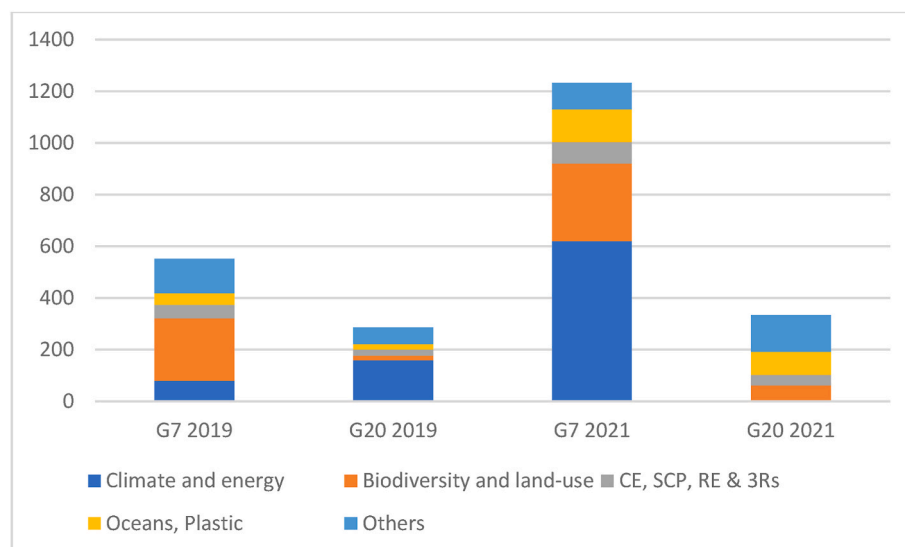


Fig. 4. Commitments across G7 and G20 compared for themes (2019 and 2021).

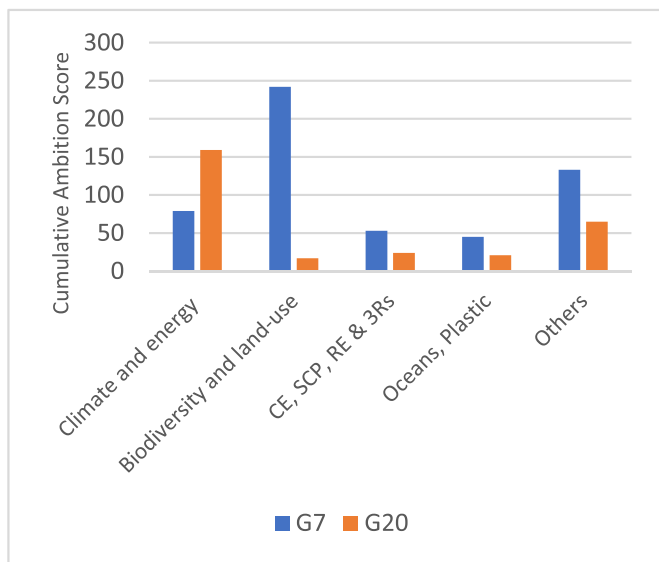


Fig. 5. G7 and G20 cumulative score by themes 2019.

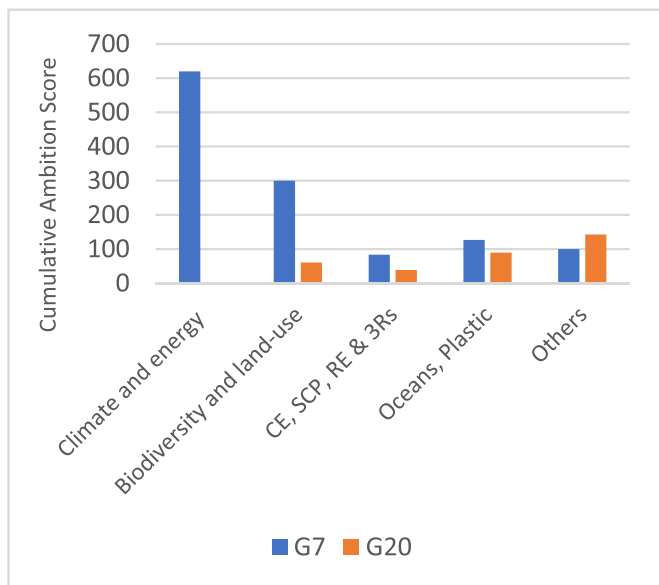


Fig. 6. G7 and G20 cumulative scores by themes 2021.

G7 environmental outcomes in 2019 and 2021. The G7 2019 scored over 500 on the ambition score, while the G20 scored less than 300. In 2021, an even more stark difference is evident: the G7 ambition score is over 1200, while the G20 scored a little over 300. Figs. 5 and 6 offer a slightly more nuanced view of the same data by disaggregating the scores by different themes. Those figures suggest that the G7 outscored the G20 on four out of five issues in 2019, with climate change as the lone exception. In 2021, the G7 again registered higher scores on four out of five issues with the category “others” as the only exception. In addition, in 2021 the G7 climate change score was nearly twice as large as all of the other issues covered in the G20 environmental communique.

5.2. Leadership connected to large events raises ambitions

The hypothesis that leadership connected to large events influences the language in relevant documents finds strong support. Two different presentations of the data and focusing on the UK and Japan illustrate this support.

The first presentation involves a scatterplot of ambition scores over time with the inclusion of labels for years/documents led by the UK and Japan (see Fig. 7). The labels show the UK significantly above trend, while Japan scored below trend. The UK's above-trend performance in 2005 is likely attributable to the use of the G7 to raise the profile of the Stern Report—a well-recognized economic analysis of the costs and benefits of responding to climate change (Stern, 2006). Similarly, the above-trend score in 2021 likely reflected an effort to highlight the then upcoming COP 26 meeting in Glasgow and release of the high-profile Dasgupta Review on the economics of biodiversity (Dasgupta, 2021). On the other hand, Japan's below trend performance may be attributable to generating a wide variety of documents. The emphasis on diversity may have also weakened support for any one specific issue.

A similar inference can be drawn from Table 5. That table presents the results of six linear regression models. Models 1 and 2 use ambition scores with the scaling of 1, 2, and 3 as dependent variables. Model 3 and 4 use scores with the scaling of 1, 2, and 4. Models 5 and 6 use scores with the scaling of 1, 3, and 9. The difference between models 1 and 2; models 3 and 4; models 5 and 6 are dummy variables for documents led by the UK and Japan.

Two findings from regression results support the conclusion that strategic leadership matters. The first are the signs, magnitudes and standard errors for the UK and Japan coefficients in Models 2, 4, and 6. In all three models, the results suggest that effect of UK and/or Japan leadership on language was statistically and substantively different from zero. A second approach involves an f-test. Rather than look at particular variables, an f-test can assess whether the inclusion of different variables improve the fit of models. In this case, f-tests suggest that models with the UK and Japan variables (models 2, 4, and 6) fit of the data better than models with just variables for the G7. As such, the UK and Japan leadership variables should be included in the model.

5.3. Qualifications and additional terms

Before moving to the discussion, it is important to point out that the terms used for the testing are not free of imperfections. For example, qualifying text can weaken otherwise ambitious language. In this regard, it could be important to check text for qualifiers such as “as appropriate” or “given national circumstances.” These terms could reveal any intent to weaken commitments. A comparison of the G7 and G20 shows that the term “appropriate” is more common in the G7 (113 references in the G7 compared to 59 references in the G20); in contrast, the G20 refers more frequently to “circumstances” (24 references in the G7 compared to 55 references in the G20). The additions could be presented as a supplement to existing analysis or contribute to more nuanced ambition index. Similarly, it could be possible to include additional terms in the ambition index that connote intended changes in behavior such as the term “ambition” itself. A comparison of the G7 and G20 texts reveals, for instance, that the term ambition appears more frequently in G7 (59 references in the G7 compared to 10 references in the G20).

6. Discussion

The findings in this paper provide insights into how ambitions vary across G7 and G20 environmental outcome documents. This is important because the G7 and G20 may set the stage for similar language in global environmental agreements or influence national policy. The paper also contributes to longstanding debates on how clubs of varying size and diversity achieve outcomes with varying levels of ambition. Beyond these general implications, the study also has specific implications that follow logically from each of the hypotheses. This section discusses those implications as well as areas for future research.

6.1. Policy implications

The first hypothesis associated with membership constellation was

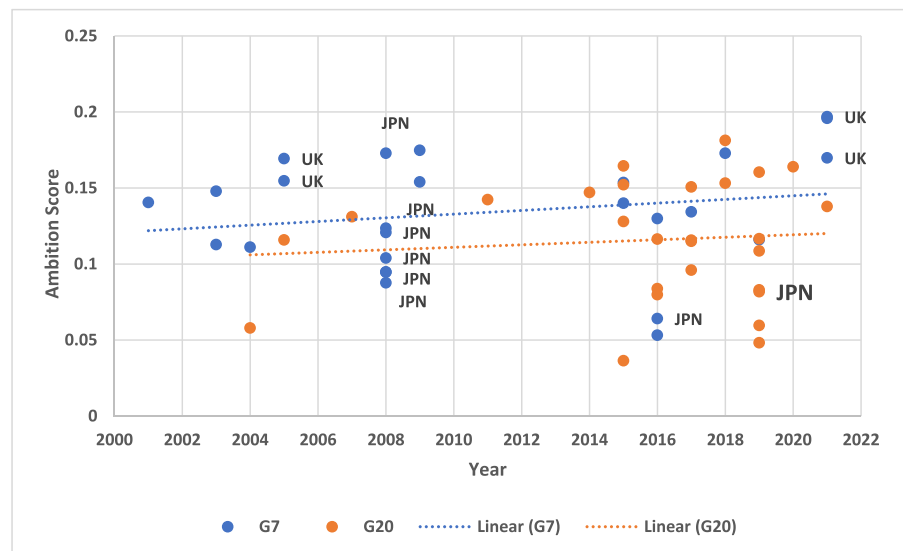


Fig. 7. Ambition scores over time with markers for the UK and Japan.

Table 5
Regression results.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	.118*** (.008)	.125*** (.007)	.133*** (.009)	.144*** (.008)	.241*** (.02)	.269*** (.017)
G7 (Dummy)	.019* (.011)	.011 (.010)	.026* (.013)	.016 (.011)	.060* (.026)	.040* (.010)
UK		.046* (.019)		.054* (.023)		.107* (.023)
Japan		-.028* (.012)		-.041** (.013)		-.104*** (.045)
R ²	.056	.252	.071	.311	.089	.379

“the smaller and less diverse the club, the higher its ambitions.” This hypothesis was associated with the expectation that “G7 documents will contain more ambitious language than G20 documents.” The research found that this was indeed the case. G7 documents consistently contained language that reflected greater ambitions than G20 documents.

This finding has several important policy implications. In particular, if the G7 is typically arriving at stronger language than the G20, smaller groups of more likeminded actors might reach consensus on more ambitious terms in a range of environmental agreements. This suggests the potential of clubs, especially the G7, to compensate for the failure of the international community to successfully manage the global commons. Smaller groups, while limited by their size, may be an important part of the solution moving forward. This is provided their actions are indeed representative of the larger common good and not beholden to a subset of exclusive or vested interests, and they indeed lead by implementing decisions commensurate with the ambitious language in their outcome documents.

At the same time, this finding raises important questions about tensions between representativeness, inclusiveness, and effectiveness. Existing research examines trade-offs between the ability of a small exclusive group of likeminded countries to be ambitious and the acceptability or representativeness of what they agree to by distinguishing between input legitimacy (representativeness) and output legitimacy (effectiveness) (Brandi, 2019). Others look at this issue through a more political or ethical lens, noting that more effective outputs may nonetheless be illegitimate (Bissio 2019). Those working on environmental governance, then, may find efforts to craft optimal institutional design place them between the proverbial rock and a hard place wherein more representative bodies are unable to produce

legitimate outcomes and effective bodies produce illegitimate outcomes.

A more pragmatic view could be that smaller and less diverse clubs foster consensus around important environmental issues before they are negotiated in larger fora. For example, smaller and more homogenous groups could build consensus around more ambitious targets first within their club. These groups may then gradually widen their membership to include other countries in initiatives such as ‘group of friends’ on a given issue to build consensus beyond the limited club membership. Helping to bring about consensus in larger groups of countries could necessitate combining ambitious language on an environmental issue with terms that also address outstanding concerns and interests (for example, finances or technology) of the larger more diverse group of countries.

The aforementioned Climate Club from the German G7 presidency is one such example that other subsequent G7 presidencies could consider in other environmental areas, where global action and representation is necessary but where smaller clubs can begin demonstrating leadership to increase overall ambition. Practically, one might imagine that politically difficult issues could initially remain separate from the larger group and be discussed in smaller group contexts—such as what is being done with critical minerals in the context of renewable energy transition or how climate financing pledges can be met to support low-carbon development in poorer countries.

A related possible solution is more careful thought and study of the size and diversity within clubs. For instance, it may be preferable to consider building a club with few members but with varying levels of development, contrasting national interests and differing views on the contributions and consequences of a problem. In constructing small yet diverse clubs, it may prove easier to reconcile differences on contentious issues. This could then signal to other countries that there is potential to

build consensus on less divisive issues. The suggestion look more carefully at initial club construction follows previously cited research that underlines how clubs can work to set the playing field for deeper cooperation and how a careful reading of membership interests merit more attention (Gray et al., 2017; Unger and Thielges, 2021; Falkner, 2016). There is also some experience with such an approach when debating the Sustainable Development Goals (SDGs). That process created sets of three-country member troikas with often diverse members (i.e. Cyprus, Singapore and United Arab Emirates). The views of these troikas contributed to a larger discussion in theme-specific open working groups that helped shape the SDGs.

The second hypothesis—that “strategic leadership connected to large events raise ambitions from clubs”—was linked to the empirical expectation that *“the commitments contained in G7 and G20 outcome documents will be greater when presidency countries use their tools and the motivation of concurrent large events to raise ambitions.”* In this case, the research found that leadership connected to large events can lead to stronger language. The case of the UK in particular suggests that countries can use their steering powers to raise ambition.

This finding has implications suggesting that leadership approaches can influence the substance of environmental negotiations and create followers (Busby and Urpelainen, 2020). More concretely, it suggests the way that leaders can set the agenda, solicit inputs, and track progress may influence outcomes. For example, presiding countries may want to clarify rules of procedure during their negotiations that demonstrate what was said by whom in what context; such clear rules may be even more vital when discussions and negotiations take place online. At the same time, it suggests that the international community may also want to consider timing G7 or G20 negotiations sequential with important environmental meetings or scientific publications and that issues to be discussed at the COP could be tabled for discussion at G7 and G20 meetings to test options for consensus before the larger COP.

As mentioned, representativeness remains a concern for homogenous clubs such as the G7 and perhaps to a lesser extent the G20 when dealing with environmental issues around global public goods. In that sense, any decisions made by the limited membership in those clubs will impact the rest of the world, for better and for worse. This responsibility seems to be increasingly recognized, because both clubs examined in this paper are not environmental or climate clubs *per se*, but are economic clubs that have increasingly begun addressing climate and environmental issues. This can be a boon for integration of environmental concerns across important sectors such as trade, transport, energy, economy, but can also be an impediment for real needed change if the environment and climate become add-ons to the conventional economic issues.

6.2. Future research

While the previous subsection suggests the article’s implications, this subsection covers areas for future research.

First, the article uses selected terms and associated coding scheme to assess ambition. As noted previously, this approach does not examine any substantive content following the key terms. It is indeed possible that countries “commit,” “affirm [the need]” or “adopt [actions]” that do little to alter behavior. For instance, the G7 and G20 may “commit” to look more closely at the reasons behind marine litter. At the same time, G7 and G20 could “encourage,” “urge” or “stress” the need for something without committing to make significant changes in behavior. To examine how that could influence the level of ambition, future research could examine significant shifts in substance in individual texts. A recent case in point occurred in 2022 under the G7 German presidency with agreements on cautiously framed language on coal phase-out. Looking for and coding for such breakthroughs might be a useful addition for

future research.

A related area for additional study involves addressing concerns about whether the club itself is chiefly responsible for identified trends in the data. In particular, other factors such as the rising intensity of environmental problems or growing public concerns over those problems could contribute to shifts in ambitions in club texts apart from the work done in the clubs themselves. Future qualitative studies that undertake interviews with G7 and G20 policymakers and other experts could shed light on the role of additional factors and explanations.

Another area for future research is whether stated intentions on paper actually translate into domestic policy and action. Though this study has concentrated on normative ambitions, a logical question is whether commitments on paper actually change behavior. This links back to the argument by Nordhaus (2015) on the need for clubs to possess instruments that can penalize or sanction non-participation by its members. Unfortunately for the environment, clubs with such characteristics do not exist at present. Looking at what options could support greater compliance is arguably an important addition to club governance research. One step in that direction could be to examine whether stated commitments lead to higher levels of commensurate domestic policy implementation. This issue could be explored with careful case studies or by linking the findings in this research with related studies that focus on tracing domestic policy trends of club member countries. Importantly and as suggested previously, the aforementioned studies from the University of Toronto suggest that there does indeed seem to be a correlation between their measures of commitment and compliance for both the G7 and G20 across a wide range of policy areas.

A final for area of future study involves the tension—and related need for balancing—representation and ambition. Small and homogenous clubs may agree to take significant actions but may have a limited effect on the problem they intend to solve because of their size. Such clubs may also miss the concerns of key contributors to those problems and fail to motivate non-members. While the need for representativeness is real and appealing, the reality is that decisive commitments on the environment are needed. Commitments by two large countries like China and the United States for example could induce persuasive changes for other countries to follow. This is especially relevant to examine in the context of the ongoing shift from a unipolar to a multi-polar world.

CRediT authorship contribution statement

Simon Høiberg Olsen: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing. **Eric Zusman:** Conceptualization, Methodology, Formal analysis, Investigation, Data curation, Writing – original draft, Writing – review & editing. **Charlotte Unger:** Conceptualization, Methodology, Writing – original draft, Writing – review & editing. **Erin C. Kawazu:** Investigation, Writing – original draft. **Nobue Amanuma:** Investigation, Writing – original draft. **Matthew Hengesbaugh:** Investigation, Writing – original draft. **Chika Aoki-Suzuki:** Investigation, Writing – original draft.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Annex. Reviewed documents

G7 Outcomes	G20 Outcomes
2001-G8 Environment Ministers Communiqué	2004-G20 Accord for Sustained Growth
2003-G8 Evian Summit-Water - A G8 Action Plan	2005-G-20 Reform Agenda For 2005-Agreed Actions to Implement The G-20 Accord for Sustained Growth
2003 G8 Evian Summit-Marine Environment and Tanker Safety - A G8 Action Plan	2007-G-20 Reform Agenda 2007-Agreed Actions to Implement The G-20 Accord for Sustained Growth
2004-Science and Technology for Sustainable Development-3r Action Plan and Progress on Implementation	2011-G20-Cannes Summit Final Declaration Building Our Common Future-Renewed Collective Action for The Benefit for The Benefit All
2005-G8 Environment and Development Ministerial-Chairman's Statement	2014-G20 Principles on Energy Collaboration
2005-Gleneagles Plan of Action Climate Change, Clean Energy and Sustainable Development (G8 Gleneagles Summit)	2015-Communiqué, G20 Energy Ministers Meeting
2008-Chair's Summary, G8 Environment Ministers Meeting	2015-G20-Inclusive Growth and Development-2015 Antalya Development Roadmap
2008-Consolidated List of Energy Efficiency Recommendations Prepared by The IEA For the G8 Under the Gleneagles Plan of Action (G8 Energy Ministers' Meeting)	2015-G20 Action Plan Action Plan on Food Security and Sustainable Food Systems
2008-Declaration, International Partnership for Energy Efficiency Cooperation [IPEEC] (G8 Energy Ministers' Meeting)	2015-G20 Toolkit of Voluntary Options for Renewable Energy Deployment
2008-Joint Statement by Energy Ministers of G8, The Peoples Republic of China, India and The Republic of Korea (G8 Energy Ministers' Meeting)	2016-G20 Action Plan on the 2030 Agenda for Sustainable Development
2008-Joint Statement by G8 Energy Ministers	2016-G20 Energy Efficiency Leading Programme
2008-Kobe 3r Action Plan, G8 Environment Ministers Meeting 2008	2016-G20 Voluntary Action Plan on Renewable Energy
2008-Kobe Call for Action for Biodiversity, G8 Environment Ministers Meeting 2008	2017-G20 Action Plan on Marine Litter
2009-A Stronger G8-Africa Partnership on Water and Sanitation	2017-G20 Agriculture Ministers' Declaration 2017, Towards Food and Water Security-Fostering Sustainability, Advancing Innovation
2009-G8 L'Aquila Summit Responsible Leadership for A Sustainable Future	2017-G20 Resource Efficiency Dialogue
2015-Communiqué-G7 Hamburg Initiative for Sustainable Energy Security	2017-Hamburg Update-Taking Forward the G20 Action Plan on the 2030 Agenda for Sustainable Development
2015-G7 Kitakyushu Energy Ministerial Meeting, Kitakyushu Initiative on Energy Security for Global Growth, Joint Statement	2018-G20 Energy Ministers Communiqué
2016-CONNEX Guiding Principles Towards Sustainable Development	2018-G20 Leaders' Declaration-Building Consensus for Fair and Sustainable Development
2016-Recommendations – G7 Expert Workshop on Future of The Oceans and Seas	2019-Communiqué G20 Ministerial Meeting on Energy Transitions and Global Environment for Sustainable Growth
2016-Toyama Framework on Material Cycles	2019-G-20-Annex 1 For Better Plant Health
2017-G7 Rome Energy Ministerial Meeting – Energy Security-From Rome 2014 To Rome 2017	2019-G20 Action Agenda on Adaptation and Resilient Infrastructure
2018-Charlevoix Blueprint for Healthy Blueprint for Healthy Oceans, Seas and Resilient Coastal Communities	2019-G20 Development Working Group (DWG) Guiding Principles for The Development of Science, Technology, And Innovation for SDGs Roadmaps
2019-Biarritz Chair's Summary on Climate, Biodiversity and Oceans	2019-G20 Implementation Framework for Actions on Marine Plastic Litter
G7 Environment Ministers' Meeting Metz, France Communiqué	2019-G20 Karuizawa Innovation Action Plan on Energy Transitions and Global Environment for Sustainable Growth
2021-Carbis Bay G7 Summit Communiqué-Our Shared Agenda for Global Action to Build Back Better	2019-Osaka Update on The G20 Osaka Update on The G20 Action Plan on the 2030 Agenda for Sustainable Development
2021-G7 2030 Nature Compact	2020-G20-Annex I-The Framework for Strong, Sustainable and Balanced Growth
2021-G7 Climate and Environment Ministers' Meeting Communiqué	2021-G20 Environment Communiqué Final

References

- Abott, Kenneth W., Genschel, Philipp, Snidal, Duncan, Zangl, Bernhard, 2015. International organizations as orchestrators. In: Abott, B., Kenneth, W. (Eds.), Genschel, Philipp, Snidal, Duncan, Zangl. Cambridge University Press, Cambridge.
- Andersen, Steinar, 2007. Key actors in an environmental governance: influence, reform and leadership. *Int. Environ. Agreements Polit. Law Econ.* 7 (4), 457–468. <https://doi.org/10.1007/s10784-007-9049-z>.
- Antholis, William, Talbott, Strobe, 2011. *Fast Forward: Ethics and Politics in the Age of Global Warming, Revised Edition*.
- Biermann, Frank, Pattberg, Philipp, van Asselt, Harro, Zelli, Fariborz, 2009. The fragmentation of global governance architectures: a framework for analysis. *Global Environ. Polit.* 9 (4), 14–40. <https://doi.org/10.1162/glep.2009.9.4.14>.
- Bissio, B. Y. Roberto, 2019. Club Governance: Can the World Still Be Run by Gentlemen's Agreements? 51–58.
- Brandi, Clara, 2019. Club governance and legitimacy: the perspective of old and rising powers on the G7 and the G20. *S. Afr. J. Int. Afr.* 26 (4), 685–702.
- Brenton, Anthony, 2013. 'Great powers' in climate politics. *Clim. Pol.* 13 (5), 541–546. <https://doi.org/10.1080/14693062.2013.774632>.
- Buchanan, James, 1965. An economic theory of clubs author. *Econometrica* 32 (125), 1–14.
- Bundesregierung, Die, 2016. Argentinien übernimmt G20-Vorsitz. Retrieved. <http://www.bundesregierung.de/breg-de/aktuelles/argentinien-uebernimmt-g20-vorsitz-440086>. (Accessed 4 August 2022).
- Burns, Charlotte, Eckersley, Peter, Paul, Tobin, 2020. EU environmental policy in times of crisis. *J. Eur. Publ. Pol.* 27 (1), 1–19. <https://doi.org/10.1080/13501763.2018.1561741>.
- Busby, Joshua W., Urpelainen, Johannes, 2020. Following the leaders? How to restore progress in global climate governance. *Global Environ. Polit.* 20 (4), 99–121. https://doi.org/10.1162/glep_a_00562.
- Castro, Paula, 2020. Past and future of burden sharing in the climate regime: positions and ambition from a top-down to a bottom-up governance system. *Int. Environ. Agreements Polit. Law Econ.* 20 (1).
- Collins, Andrea, Flynn, Andrew, 2008. Measuring the environmental sustainability of a major sporting event: a case study of the FA cup final. *Tourism Econ.* 14 (4), 751–768. <https://doi.org/10.5367/000000008786440120>.
- Dasgupta, P., 2021. *The Economics of Biodiversity: the Dasgupta Review*. HM Treasury, London.
- Eckersley, Robyn, 2012. Moving forward in the climate negotiations: multilateralism or unilateralism? *Global Environ. Polit.* 12 (2), 24–42. https://doi.org/10.1162/glep_a_00107.
- Falkner, Robert, 2016. A unilateral solution for global climate change? On bargaining efficiency, club benefits, and international legitimacy. *Perspect. Polit.* 14 (1), 87–101. <https://doi.org/10.1017/S1537592715003242>.
- G20 Research Group, 2020. *Compliance Coding Manual for International Institutional Commitments*.
- Garry, John, Laver, Michael, 2000. Estimating policy positions from political texts. *Am. J. Polit. Sci.* 44 (3), 619–634.
- Germany, G.7, 2022. *G7 Statement on Climate Club*.
- Giddens, Anthony, 2011. *The Politics of Climate Change*, vol. 43. Wiley.
- Gray, Julia, Lindstädt, René, Slapin, Jonathan B., 2017. The dynamics of enlargement in international organizations. *Int. Interact.* 43 (4), 619–642.
- Green, Jessica F., 2017. The strength of weakness: pseudo-clubs in the climate regime. *Climatic Change* 144 (1), 41–52. <https://doi.org/10.1007/S10584-015-1481-4>.
- Gupta, Joyeeta, Rings, Lasse, 2001. The EU's climate leadership: reconciling ambition and reality. *Int. Environ. Agreements Polit. Law Econ.* 1, 281–299.
- Hovi, Jon, Skodvin, Tora, Aakre, Stine, 2013. Can climate change negotiations succeed? *Polit. Govern.* 1 (2), 138–150.
- Jordans, Frank, 2022. *EXPLAINER: Why Germany Is Pushing for a 'Climate Club.'* Associated Press, June.

- Kellenberg, Derek, Levinson, Arik, 2014. Waste of effort? international environmental agreements. *Journal of the Association of Environmental and Resource Economists* 1 (1/2), 135–169.
- Keohane, Robert O., Victor, David G., 2016. Cooperation and discord in global climate policy. *Nat. Clim. Change* 6 (6), 570–575. <https://doi.org/10.1038/nclimate2937>.
- Kirton, John, Kokotsis, Ella, 2015. *The Global Governance of Climate Change*. Ashgate, Burlington and Farnham.
- Lamb, Kate, Yuddy Cahya, Budiman, 2022. G20 Climate Talks in Indonesia Fail to Agree Communiqué. Reuters, August.
- Mathur, Akshay, 2019. India must build the capacity to make its G20 presidency in the future a success. In: *The Indian Express*. Retrieved. <https://indianexpress.com/article/opinion/columns/g20-summit-2020-india-narendra-modi-5558463/>. (Accessed 16 September 2022).
- Meuleman, Louis, Niestroy, Ingeborg, 2015. Common but differentiated governance: a metagovernance approach to make the SDGs work. *Sustainability* 7 (9), 12295–12321. <https://doi.org/10.3390/su70912295>.
- Naim, Moisés, 2009. Minilateralism: the magic number to get real international action. *Foreign Pol.* 173, 135–136.
- Nordhaus, William, 2015. Climate clubs : overcoming free-riding in international climate policy. *Am. Econ. Rev.* 105 (4), 1339–1370.
- Olsen, Simon Højberg, Zusman, Eric, Hengesbaugh, Matthew, 2021. *Governing the Sustainable Development Goals in the COVID-19 Era: Bringing Back Hierarchic Styles of Governance?* Tokyo.
- Olson, Mancur, 1971. *The Logic of Collective Action: Public Goods and the Theory of Groups*, vol. XXXI. Harvard University Press.
- Sandler, Todd, Tschirhart, John T., 1980. The economic theory of clubs: an evaluative survey. *J. Econ. Lit.* 18 (4), 1481–1521.
- Seiermann, Julia, 2018. Only words? How power in trade agreement texts affects international trade flows. *UNCTAD Research Paper. No. 26* 87–119.
- Shen, Yongdong, Ahlers, Anna L., 2019. Blue sky fabrication in China: science-policy integration in air pollution regulation campaigns for mega-events. *Environ. Sci. Pol.* 94, 135–142. <https://doi.org/10.1016/j.envsci.2018.12.005>.
- Silge, Julia, Robinson, James, 2022. *Text Mining with R: A Tidy Approach*. Bookdown.
- Sobel, Mark, 2021. G7 Finds New Purpose as G20 Takes Back Seat. *Official Monetary and Financial Institutions Forum*.
- Stern, Nicholas, 2006. *Stern Review on the Economics of Climate Change*. London.
- Undp, Unfccc, 2019. *The Heat Is on*.
- Unger, Charlotte, Thielges, Sonja, 2021. Preparing the playing field: climate club governance of the G20, climate and clean air coalition, and Under2 coalition. *Climatic Change* 167 (3–4), 1–21. <https://doi.org/10.1007/s10584-021-03189-8>.
- Unger, Charlotte, Kathleen, A. Mar, Konrad, Gürtler, 2020. A club's contribution to global climate governance: the case of the climate and clean air coalition. *Palgrave Communications* 6 (1), 1–10. <https://doi.org/10.1057/s41599-020-0474-8>.
- Van de Graaf, Thijs, Westphal, Kirsten, 2011. The G8 and G20 as global steering committees for energy: opportunities and constraints. *Global Policy* 2 (Suppl. 1), 19–30. <https://doi.org/10.1111/j.1758-5899.2011.00121.x>.
- Vener, James, Franssen, Taryn, Kelly, Levin, Baumwoll, Jennifer, Elliott, Cynthia, Ross, Katherine, 2019. Scaling up ambition: leveraging nationally determined contributions and long-term strategies to achieve the Paris agreement Goals | world resources institute. Retrieved. <https://www.wri.org/research/scaling-ambition-leveraging-nationally-determined-contributions-and-long-term-strategies>. (Accessed 4 August 2022).
- Victor, David G., 2006. *Cooperation on Climate Change: Numbers, Interests and Institutions*, pp. 90–104. August.
- Vogler, John, Stephan, Hannes R., 2007. The European union in global environmental governance: leadership in the making? *Int. Environ. Agreements Polit. Law Econ.* 7 (4), 389–413. <https://doi.org/10.1007/s10784-007-9051-5>.
- Weischer, Lutz, Morgan, Jennifer, Patel, Milap, 2012. Climate clubs: can small groups of countries make a big difference in addressing climate change? *Rev. Eur. Community Int. Environ. Law* 21 (3), 177–192. <https://doi.org/10.1111/reel.12007>.
- Westphal, Kirsten, Röhrkasten, Sybille, 2020. The G20 and its role in global energy governance. In: *Sustainable Energy in the G20: Prospects for a Global Energy Transition*.
- Young, Oran R., 1991. Political leadership and regime formation: on the development of institutions in international society. *Int. Organ.* 45 (3), 281–308. <https://doi.org/10.1017/S0020818300033117>.
- Zhou, Xin, Moïnuddin, Mustafa, 2017. *Sustainable Development Goals Interlinkages and Network Analysis: A Practical Tool for SDG Integration and Policy Coherence*. Hayama.