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PERSPECTIVE

Policy diffusion in global biodiversity conservation: Learning, competition, coercion, and emulation amid US–China great-power politics

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Abstract

Coordinated policies and effective global environmental governance are needed to address the global biodiversity crisis. Human dimensions like geopolitics influence conservation decision-making and outcomes. The importance of considering these complex social factors is heightened in an era of renewed great-power politics, as the intensifying US–China rivalry has direct implications for environmental governance and biodiversity outcomes. Can the US–China rivalry and its confrontational dynamics be channeled into conservation policy-making to improve biodiversity outcomes? Drawing from international relations and policy studies, policy diffusion theory can provide conservationists with useful insights into the interdependency of policy decisions. Here, we examine the four mechanisms—competition, coercion, learning, and emulation—of the classic model of policy diffusion theory in the context of environmental policy-making. We explore a case study for each mechanism to illustrate how it can benefit biodiversity conservation, and point to examples of relevant policies and actions that could improve outcomes. To operationalize this concept for conservation, we present a decision tree that conservationists can use to determine the most relevant policy diffusion mechanism in different policy contexts. Upon determining the appropriate mechanism, conservationists can take further steps to intentionally trigger the mechanism and catalyze conservation policy diffusion across jurisdictions.

KEYWORDS
biodiversity loss, conservation policy, conservation social science, geopolitical tensions, global environmental governance, People's Republic of China, Sino–US relations, United States of America

1 | INTRODUCTION

Global biodiversity loss is one of the grand challenges facing humanity, and addressing its drivers requires coordinated policies and solutions at multiple levels. Global efforts to date, including the 2002–2010 and 2010–2020 Strategic Plans of the Convention on Biological Diversity (CBD), have failed to achieve their goals (IPBES, 2019; Secretariat of the Convention on Biological Diversity, 2020). Continued failure will be catastrophic for nature (Armstrong McKay et al., 2022). The new Kunming–Montreal Global Biodiversity Framework (GBF), with its 23 biodiversity targets for 2030 and vision for 2050, has the potential to be a turning point for biodiversity. However, much will depend on the willingness of countries and leading actors to implement transformative change (Obura, 2023). In a fast-changing geopolitical environment, conservation policies must consider and find compromises that account for diverse motivations, objectives, priorities, and needs. Social factors like political will and geopolitics influence environmental decision-making and outcomes (Cheung et al., 2023). The social sciences can facilitate more effective conservation policies and actions by enhancing conservationists' understanding of the human dimensions of environmental issues (Bennett et al., 2017). Drawing from international relations and policy studies, policy diffusion theory can provide insights for conservationists striving to deliver on the GBF's promise.

Policy diffusion theory describes the interdependency of policy choices (Gilardi & Wasserfallen, 2019). Policymaking processes and outcomes are shaped by both domestic factors within polities (organized governments of cities, states, countries, and international institutions) and external policymaking (Blatter et al., 2022). Choices made by one decision-maker influence the choices made by other decision-makers. This interdependence occurs in policymaking across settings, from the spread of public health restrictions on smoking across US states to the diffusion of international river basin management policies (Metz & Fischer, 2016). Policy diffusion theory models "why and how policymakers react to decisions made elsewhere" (Gilardi & Wasserfallen, 2019), with the classic model consisting of four key mechanisms: competition, coercion, learning, and emulation. Although international relations and policy studies scholars have proposed alternative conceptual frameworks to address theoretical shortcomings and overlaps (Blatter et al., 2022), an understanding of the classic model can enable conservationists to strategically induce the four established mechanisms of policy diffusion to improve biodiversity outcomes.

The interdependency of policy choices between two countries in particular is especially critical. The US–China relationship is largely defining geopolitics in the 21st century, and has already plunged the world into an era of renewed great-power politics. China's rise has caused America's post-Cold War "unipolar moment" to give way to an emerging bipolarity (Terhalle & Depledge, 2013; Zhao, 2022). US–China relations have deteriorated rapidly in recent years, resulting in competition on economic, security, geopolitical, human rights, and technological fronts (Mearsheimer, 2021; Song & Yao, 2022). This rivalry has direct implications for global environmental governance and ecological outcomes. For instance, the lethargic and piecemeal nature of global climate negotiations and progress to date is partly attributable to the "meta-struggle between the 'great powers' of China and the United States over the nature of the global order" (Terhalle & Depledge, 2013). As the US–China rivalry intensifies, can this strategic competition and its confrontational dynamics be channeled into conservation policymaking to improve biodiversity outcomes?

In this paper, we discuss the applications of policy diffusion theory for global biodiversity conservation, using the US–China rivalry as the primary contextual backdrop. We examine the mechanisms of policy diffusion—competition, coercion, learning, and emulation—in the broader environmental policy context. We point to policies and actions that could improve biodiversity outcomes, and suggest guidelines to facilitate the strategic application of this knowledge in conservation.

2 | POLICY DIFFUSION MECHANISMS

2.1 | Competition

Countries enact policies to attract or retain investment and resources in economically and strategically important areas. The importance and mobility of capital can drive a "race to the bottom" in terms of incentives to attract investment (Gilardi & Wasserfallen, 2019; Marsh & Sharman, 2009). Incentivization underpins the competition mechanism of policy diffusion. One example of green industrial policy competition is the sudden and clustered announcement in 2016 and 2017 of goals to phase out internal combustion engine vehicle sales by 10 jurisdictions, including major economies in the automotive industry like China, Japan, South Korea, and France. These decisions were motivated in part by the desire to maintain industrial competitiveness amid the market growth and potential of electric and hydrogen fuel cell vehicles (Meckling & Nahm, 2019).

With the United States and China locked in strategic competition on multiple technological fronts, including green energy and biotechnology (Allison et al., 2021), there is a potential to raise significant levels of investment for

the development of innovations that are aligned with biodiversity conservation goals. Conservationists can seek to induce competition by advancing industrial policies that incentivize solutions to the major drivers of biodiversity loss in one jurisdiction, with the aim of putting pressure on others to do likewise in order to stay competitive. For instance, many countries have introduced investment incentives for carbon capture, utilization, and storage (CCUS). Actively promoting competition between countries will increase overall levels of CCUS investment, which would benefit conservation (GBF Target 8). Indeed, a nascent CCUS policy framework is emerging in China to compete with tax incentives enacted by the United States (see Box 1).

Encouraging competition between countries, particularly the United States and China, on incentive schemes can advance conservation aims. Target 18 of the GBF explicitly aims to scale up positive incentives for the conservation and sustainable use of biodiversity while reducing harmful incentives. Policy incentives to accelerate the development of synthetic alternatives to horseshoe crab blood—used for endotoxin detection in pharmaceutical production—can alleviate natural resource exploitation of endangered horseshoe crab species (GBF Targets 5 and 9; Maloney et al., 2018). Incentives can also be deployed to encourage the development and adoption of selective gear in the fishing industry (GBF Targets 5 and 9; Feekings et al., 2019). The private sector can play an important role, creating networks like the FAIRR Initiative (www.fairr.org), which produces sustainability indicators that corporations in the global food industry can use to access preferential financial mechanisms. Building similar networks for other industries can provide resources, facilitate investment, and encourage greater competition on environmental incentives between countries (GBF Targets 15 and 16).

2.2 | Coercion

Policy change is sometimes induced rather than voluntary. In the coercion mechanism, powerful countries and international organizations enforce policy changes by compelling others to comply (Gilardi & Wasserfallen, 2019; Marsh & Sharman, 2009). This can be achieved in various ways, including physical force, manipulating economic costs and benefits, and monopolizing information or expertise (Dobbin et al., 2007). For instance, the United States has diffused environmental norms like public participation in environmental policymaking and effective environmental law enforcement to trading partner nations through preferential trade agreements like the North American Free Trade Agreement (NAFTA), the Dominican Republic-Central America Free Trade Agreement (CAFTA-DR), and the Peru Trade Promotion Agreement (PEPTA; Jinnah & Lindsay, 2016). The European Union (EU) also includes environmental provisions in its free trade agreements.

By linking trade, state aid, and loans with environmental policies and practices, powerful countries like the United States and China can advance environmental norms and compel partner nations to improve environmental practices and raise governance standards (Dobbin et al., 2007), particularly if enforced with trade sanctions. A recent lawsuit in the United States could have resulted in trade sanctions being imposed on Mexico through the Pelly Amendment to the Fishermen's Protective Act for failing to stop illegal totoaba (*Totoaba macdonaldi*) fishing and trade, which is driving the vaquita (*Phocoena sinus*) to extinction (see Box 2). Conservationists can similarly pursue the linking of biodiversity targets with bilateral or multilateral trade, state aid, and loan agreements. For instance, measurable and enforceable objectives and standards derived from the GBF's targets can be incorporated as conditions in future US trade agreements, or as conditions for lending by the China-led Asian Infrastructure Investment Bank (AIIB; GBF Targets 14 and 20; Apolinário Júnior & Jukemura, 2022).

2.3 | Learning and emulation

Policymakers consider the costs and benefits of policies enacted elsewhere and make rational decisions for their jurisdictions accordingly. This is the basis of the learning mechanism (Gilardi and Wasserfallen 2019; Marsh & Sharman, 2009). A prominent example in the context of environmental policy is the creation of national parks around the world after the establishment of Yellowstone National Park in 1872 (Frost & Laing, 2013). Following the launch of the Building Research Establishment Environmental Assessment Method (BREEAM) in the United Kingdom in 1990, other environmental assessment tools for buildings were also developed around the world. Another example of learning-driven policy diffusion is the spread of national environmental policy plans and integrated strategies for sustainable development by governments around the world. Both advanced industrial nations and developing countries have shifted rapidly since the 1980s from a highly fragmented environmental policy approach to adopting increasingly integrated strategies guided by long-term goals spanning multiple socioeconomic aspects. This shift was also paralleled by the creation of global multilateral environmental agreements, such as the Millennium Development Goals, driven by the realization of the large disconnect and inconsistency

Case study on the diffusion of incentive schemes to accelerate carbon capture, utilization, and storage development across jurisdictions

Carbon capture, utilization, and storage

Carbon capture, utilization, and storage (CCUS) aims to capture carbon dioxide emitted from large point sources (e.g., power generation and industrial activities) or in the atmosphere (direct air capture) to be recycled for further usage or storage. Carbon dioxide can be captured using various technologies, including chemical absorption, adsorption, membrane separation, and gas hydrates. Captured carbon can either be used to produce chemicals, fuels, plastics, and carbon-containing minerals, or stored in saline aquifers and depleted hydrocarbon reservoirs (Zhang et al., 2020).

Competition increases investment

Despite the critical role that CCUS must play to address climate change, cost has been a major hurdle and deployment remains limited. CCUS remains a relatively expensive process that yields a generally inexpensive product. Building out infrastructure for each of the component steps of the process is also costly. Incentivization can facilitate near-term CCUS deployment while accelerating technological development to reduce costs (Cabrera et al., 2022). Increasing the levels of competition between countries in terms of incentive schemes for clean technologies could attract more overall investment in CCUS projects and accelerate emissions reductions (Beck et al., 2023).

CCUS incentives in the United States and their diffusion in China

In the United States, tax credit provisions for CCUS projects known as "45Q" were created in 2008 to provide a performance-based tax credit for carbon capture projects at power plants and industrial facilities. In basic terms, 45Q tax credits provide \$60/tCO_2 going to enhanced oil recovery (EOR), and \$85/tCO_2 for straight storage (International Energy Agency, 2022; Victor & Nichols, 2022).

China's rapid growth over the past several decades has been largely propelled by fossil fuels. A nascent CCUS policy framework is emerging in China, where the central government has included CCUS in its future national carbon mitigation strategies since the 12th Five-year Plan in 2011. More than 10 departments have since worked CCUS into their policies. However, a lack of financial subsidies is one of several major challenges still to be

resolved, and has contributed to the currently low participation rates of Chinese companies in CCUS (Jiang et al., 2020; Ma et al., 2023; Zhang et al., 2022). Drawing on the 45Q tax credit provisions in the United States, scholars have developed and assessed various subsidy schemes that can be implemented in China (Fan et al., 2019, 2020; Yang et al., 2019).

among many smaller existing agreements (Kim, 2013; Tews et al., 2003).

Emulation, or mimicry, is considered to be something of a residual mechanism of policy diffusion, into which deviations from other mechanisms have tended to be bundled together. Emulation overlaps substantially with learning and are thus discussed together in this paper, though there are works in the literature that explore in greater nuance the theoretical distinctions between the two (Gilardi & Wasserfallen, 2019; Marsh & Sharman, 2009). In essence, emulation is differentiated from learning by a greater focus on the social construction of policies and appropriateness of conduct beyond direct economic benefits—countries tend to conform to norms or follow along with others for symbolic or less tangible reasons. An example of environmental policy emulation is the diffusion of renewable energy policies, whereby countries tend to emulate policies of other countries with similar power sector conditions (Baldwin et al., 2019). Another example can be found in the wildlife trade. In 2015, China entered into an agreement with the United States to ban the import and export of elephant ivory and to phase out domestic trade. Emulation was a relevant policy diffusion mechanism in this case: China conformed with international norms to meet domestic policy needs, enhance its international reputation, and bolster its soft power (Song & Yao, 2022; see Box 3).

To facilitate greater learning and emulation of conservation policies between countries, conservation scientists can seek to consolidate and increase decision-makers' access to information on best practices and policy effectiveness (GBF Targets 20 and 21). These would enable countries to more easily learn from or emulate one another's approaches to, for instance, biodiversity offsetting, which has been advanced as a policy option around the world to compensate for the biodiversity impacts of planned developments (McKenney & Kiesecker, 2010). Although China only recently updated its Wildlife Protection Law in 2016, various shortcomings remain unaddressed (Gong et al., 2020); conservationists can facilitate learning and emulation to strengthen future reforms by providing comparative analyses of corresponding laws in different jurisdictions (Waples et al., 2013).

3 | CONSERVATION IMPLICATIONS AND CONCLUSION

Achieving the GBF's targets is critical for global biodiversity; further failure of international biodiversity commitments would be catastrophic (IPBES, 2019). Conservationists must recognize and navigate complex political realities, or else risk implementing strategies that may ultimately prove ineffective. Policy diffusion theory provides conservationists with insights into the complex dynamics of policymaking, with clear implications for the strategic development and implementation of interventions. By understanding the mechanisms of policy diffusion and incorporating them into policymaking and planning for conservation, ecologically positive decision-making can be intentionally catalyzed at scale across jurisdictions, potentially at lower cost and with more lasting impact.

The insights from policy diffusion theory are particularly relevant for conservationists today given the contextual backdrop of the intensifying US–China rivalry. The United States and China are the two largest economies in the world, the two largest greenhouse gas emitters, and are together home to over a fifth of the human population. The geopolitical influence wielded by these two superpowers is such that decisions made by their leaders have globally significant implications for economic, security, and conservation outcomes (Mearsheimer, 2021). Conservationists can seek to take advantage of the US–China relationship's competitive dynamics to induce policy diffusion by triggering one of the four mechanisms.

The value of the social sciences is increasingly being recognized in conservation in understanding problems, informing processes, and improving outcomes. However, knowledge application can be challenging, and how to operationalize social science concepts in conservation strategy and planning is often unclear (Niemiec et al., 2021). In the case of policy diffusion theory, we argue that a critical first step is to be able to accurately determine which of the four mechanisms is most applicable for a given policy scenario. This mechanism could then be intentionally triggered to support the achievement of conservation targets through the cross-jurisdictional diffusion

The US Pelly Amendment to the Fishermen's Protective Act as a case study on coercion as a mechanism of policy diffusion

Pelly Amendment to the Fishermen's Protective Act and 2022 Lawsuit

Under the Pelly Amendment to the Fishermen's Protective Act of 1967, the US President can embargo wildlife products and limit other imports from nations that the Secretary of Commerce or Secretary of the Interior certifies (i.e., determines) to be engaging in trade or take that undermines the effectiveness of international threatened species protection agreements to which the United States is a party. Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) is one such agreement.

In September 2014, the Center for Biological Diversity submitted a petition for the US government to certify Mexico under the Pelly Amendment, arguing that Mexico had failed to stop illegal totoaba (*Totoaba macdonaldi*) fishing and trade that is driving the vaquita porpoise (*Phocoena sinus*) to extinction (Convention on Biological Diversity, 2023). With no decision forthcoming after 8 years had passed, the Center for Biological Diversity, Animal Welfare Institute, and Natural Resources Defense Council filed a lawsuit in December 2022 against US Secretary of the Interior, Deb Haaland, and the Department of the Interior. The lawsuit sought to force a decision over certifying Mexico, and whether sanctions should be subsequently be imposed. Meanwhile, the CITES Secretariat deemed in March 2023 that a compliance action plan on totoaba submitted by Mexico in February 2023 was inadequate, and recommended that Parties suspend all commercial trade of CITES-listed species with Mexico until a revised plan was accepted in April 2023 (United States Court of International Trade, 2023). A settlement was reached on the lawsuit in the United States in April 2023, with the Secretary of the Interior issuing a certification that "Mexican nationals are violating CITES by engaging in trade or taking of totoaba and vaquita" in May 2023 (US Department of the Interior, 2023).

President Biden's decision to not embargo Mexican products and conservation implications

With the Secretary of the Interior's certification, President Joe Biden was able to place trade sanctions on Mexico and embargo products. However, President Biden notified Congress in July 2023 that he had opted against doing so, instead directing US government departments and agencies to convene high-level dialogue with and to coordinate efforts to assist and support Mexico vis-à-vis CITES compliance action plan implementation. Furthermore, relevant departments and agencies are to assess Mexico's enforcement actions and CITES compliance action plan implementation. They are to report on Mexico's progress in 1 year, at which time it will be determined whether additional measures from the United States, including trade restrictions, are necessary (US White House, 2023).

President Biden's decision to decline embargoing products from Mexico was criticized by several environmental groups, notably including the three plaintiffs in the lawsuit. Nevertheless, this case reaffirms the effectiveness of the Pelly Amendment (Charnovitz, 1994), and illustrates how the threat of economic sanctions by powerful countries like the United States can compel trade partner nations to improve their environmental practices (Gilardi & Wasserfallen, 2019). The coercion mechanism of policy diffusion can be a powerful means of raising environmental standards and improving conservation outcomes.

Image credits—"Gobierno de la República Trabaja en la recuperación de la vaquita marina" by SEMARNAT is marked with Public Domain Mark 1.0. To view the terms, visit https://creativecommons.org/publicdomain/mark/1.0/?ref=openverse.

Case study on the role of emulation in China's agreement with the United States to ban the trade of elephant ivory

Emulation at work behind China's ivory ban

Emulation is often at work with other diffusion mechanisms, particularly learning. China's trade ban on elephant ivory illustrates the complex workings of diffusion mechanisms, involving emulation and learning. China has often been referred to as one of the hotspots of the international illegal wildlife trade. As elephants are listed in Appendix I of Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the international trade in ivory became prohibited in 1989. However, China did not completely ban the ivory trade. Ivory products were considered luxurious items. Their carvings had cultural and social significance and designated ivory artistry as a national intangible cultural heritage in 2006. For this reason, the Chinese government did not endorse listing elephants as an endangered species in CITES until 2016. In January 2018, China banned domestic trade in ivory products after launching one of the largest ever public awareness campaigns. China's motivation to comply with the international norm (i.e., the ban on ivory trade) went beyond protecting natural resources. The anticorruption campaign under Xi's regime identified ivory products as a symbol of corruption and extravagance. Indeed, ivory products have been often used as bribery items in China. Against this background, Chinese President Xi Jinping and US President Barack Obama signed a deal to ban ivory trade in 2015. As ivory items were prohibited in the Chinese domestic market, it was not difficult for China to conform to the international norm on the ivory trade ban.

In this sense, China emulated the act of prohibiting the trade in elephant ivory products under the condition that Chinese domestic preference resonates with such a ban. While there has been criticism from International nongovernmental organizations (NGOs) and western countries (e.g., the United States), China has long resisted adopting the trade ban on elephant ivory products (Gamso, 2019; Song & Yao, 2022). As domestic political dynamics changed, the conditions became favorable for emulating the policy in China. International scrutiny played an important role. NGOs in China were able to assist the Chinese government to shift public opinions on elephant ivory products (Gamso, 2019; Song & Yao, 2022). NGOs outside China increased public awareness on China's ivory trade (Gamso, 2019). Given the international pressure, China acknowledged the appropriateness and the benefits of implementing such a policy change. China's emulation did not occur "naturally." Rather, it happened as China

learned the benefits of implementing the trade ban. The perceived benefits include enhancing its soft power internationally and aligning with domestic politics without costs. To summarize, both learning and emulation have affected China's introduction of the ivory ban: learning about the new benefits arising from a change in domestic politics combined with the motivation to emulate an appropriate policy as recognized in the international community (Gamso, 2019).

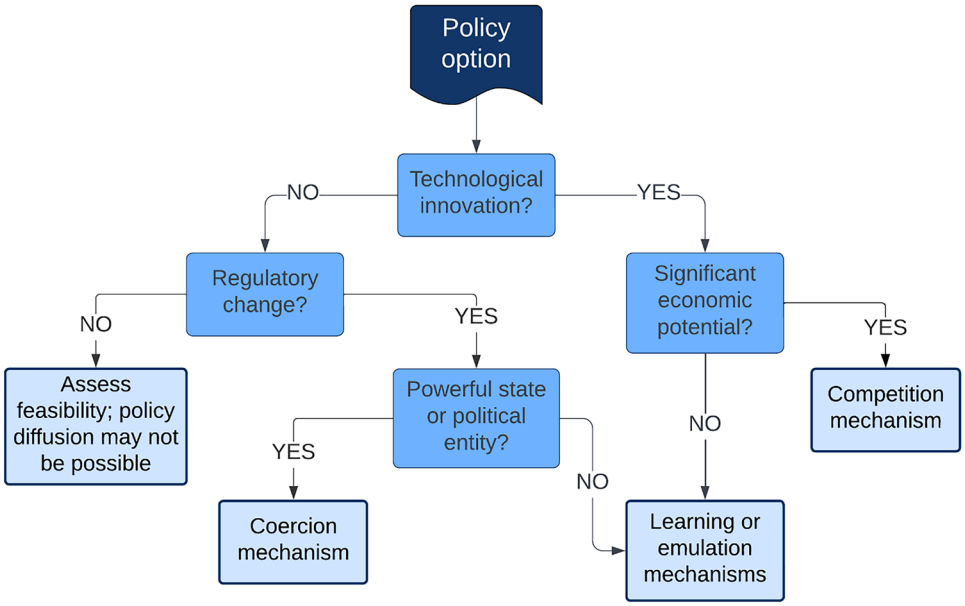

FIGURE 1 A decision tree to systematically determine which of the four policy diffusion mechanisms is most applicable for a given conservation policy. Once a mechanism has been identified, conservationists can devise suitable further steps to intentionally trigger that mechanism to catalyze policymaking across jurisdictions. For instance, to stoke Chinese competition with the US 45Q tax incentive to incentivize carbon capture, utilization, and storage (CCUS) development (Does the policy option involve a technological innovation? Yes → Is there significant economic potential? Yes → Competition mechanism identified), conservationists can actively seek to trigger the competition mechanism and accelerate the development of a CCUS policy framework in China. This can be done, for example, by referencing the US 45Q tax incentive to draft policy kernels that can facilitate the adoption of competing incentive schemes by the central and provincial governments in China.

of conservation policy. Here, we present a decision tree that conservation scientists and practitioners can utilize to systematically determine the most relevant mechanism through which to induce policy diffusion (Figure 1).

For any given policy scenario, conservationists can use this decision tree to first ascertain the most appropriate mechanism, and then devise suitable further steps to stoke competition, leverage positioning to coerce, or facilitate learning and emulation. This can be done strategically, especially in the context of US–China great-power politics, through various actions (Goyal, 2022; Koski, 2010). Conservationists operate in diverse settings and can apply an understanding of policy diffusion mechanisms accordingly to:

- influence agenda setting and focus the attention of policymakers and the public on policy innovations introduced by their competitor,
- influence the development of conservation policies that are aligned with existing political will in one of the two countries to facilitate policy adoption,
- act as knowledge brokers by providing policy kernels (base policies that act as templates to ease adaptation by policymakers for their circumstances), and

- support policy implementation with research and communication.

By strategically catalyzing the diffusion of environmental policies, conservationists may be able to accelerate and scale the impact of solutions in pursuit of GBF and other conservation goals. This may be particularly apposite for how conservationists approach the far-reaching consequences of decisions made by superpowers like the United States and China when locked in rivalry.

Policymaking is a complex process; policy decisions are not only influenced by internal or domestic factors, but also by policies enacted externally in other polities. Policy diffusion theory and its four constituent mechanisms explain why and how policymaking is affected by decisions made elsewhere (Gilardi & Wasserfallen, 2019). With the United States and China both wielding significant influence in international affairs, including ultimately the success or failure of policies to conserve global biodiversity, conservationists can apply knowledge of these mechanisms to strategically catalyze policymaking to address anthropogenic biodiversity loss more effectively.

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CONFLICTS OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

No primary data were collected for this work.

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