Catalyzing transformative change for climate and biodiversity finance within COP policy discourses

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Abstract:

Recent outcomes of the Conferences of the Parties (COP) to the UNFCCC and the UN CBD have emphasized the need for transformative change to meet global climate and biodiversity targets. Yet discourses on climate and biodiversity finance remain dominated by efforts to close "funding gaps," with comparatively little attention paid to the systemic drivers of climate change, biodiversity loss, and social injustices. Here we analyze all UNFCCC COP decision reports between 1995 and 2025, encompassing approximately 1.1 million words of text across 30 reports, and show that finance language consistently focuses on funding mobilization over systemic reforms. We then outline a roadmap for how transformative change can be operationalized for climate and biodiversity finance policy in practice. Specifically, we explore the role of subsidy reforms, financial regulations, policy coherence, debt justice, and equitable access to finance. Together, these interventions can provide a foundation for advancing equitable, transformative change within climate and biodiversity finance policy.

Main

Mobilizing finance for climate and nature is one of the most prominent focal areas in current international environmental policy discourses. The Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) in Belém 2025 closed with the Baku-Belém roadmap that aims to mobilize 1.3 trillion USD yearly in climate finance up until 2035[1], and the recent Convention on Biological Diversity (CBD) in Rome (resumed following Cali) ended with an agreement to raise 200 billion USD yearly for biodiversity protection by 2030 and an additional 500 billion USD from shifted subsidies[2]. These agreements are the latest in a series of Rio Convention decisions emphasizing funding mobilization, aligning with a prevailing policy narrative of closing 'funding gaps'[3–5].

Financial pledges made through international conventions towards these targets are repeatedly unmet and contributions fall short of the stated funding gaps[6,7], although recent research has highlighted the challenges of accurately assessing such finance flows[8]. More importantly, the outsized focus on funding mobilization to address environmental challenges risks detracting attention from the larger and more urgent task of addressing the macroeconomic injustices and ongoing investments in activities that drive climate change and biodiversity loss in the first place. This is especially pressing given growing evidence that climate and ecological systems are approaching or breaching irreversible tipping points[9–11], and that protecting high-integrity ecosystems is more effective for both carbon storage and biodiversity conservation than restoring degraded ones[12–14].

Current international macroeconomic conditions and monetary systems can undermine climate and biodiversity targets while constraining the capacity of vulnerable countries to respond to environmental crises. One central challenge is the financial counter-pressure from ongoing public and private investments in activities that drive ecosystem destruction and climate change **(Figure 1)**, while international regulatory frameworks often remain inadequate to ensure transparent and environmentally just finance flows. These tensions raise questions about the effectiveness of environmental targets in their current form. For example, while the prior UNFCCC climate finance goal was reportedly met in 2022 carbon accumulation in the atmosphere continued to increase **(Figure 1)**. Carbon in the atmosphere increased by 3.5ppm between 2023 and 2024, one of the largest single years on record, driven primarily by fossil fuel emissions and amplified by a strong El Niño**.**

We conducted a content analysis of all UNFCCC COP decision reports to examine whether the gap between policy ambition and environmental outcomes is reflected in how finance is discussed within international environmental conventions. We found that financial drivers of climate change and environmental degradation receive comparatively limited attention in environmental finance discourses. We focus specifically on UNFCCC discussions that quantified funding targets, gaps, financial flows, specific funds, and harmful subsidies in USD over time (see Appendix 1 for UNFCCC decision report analysis methods). We then turn to the core contribution of the paper where we provide recommendations for how this discourse can be changed and how transformative change within climate and biodiversity finance policy discourse could be operationalized in practice.

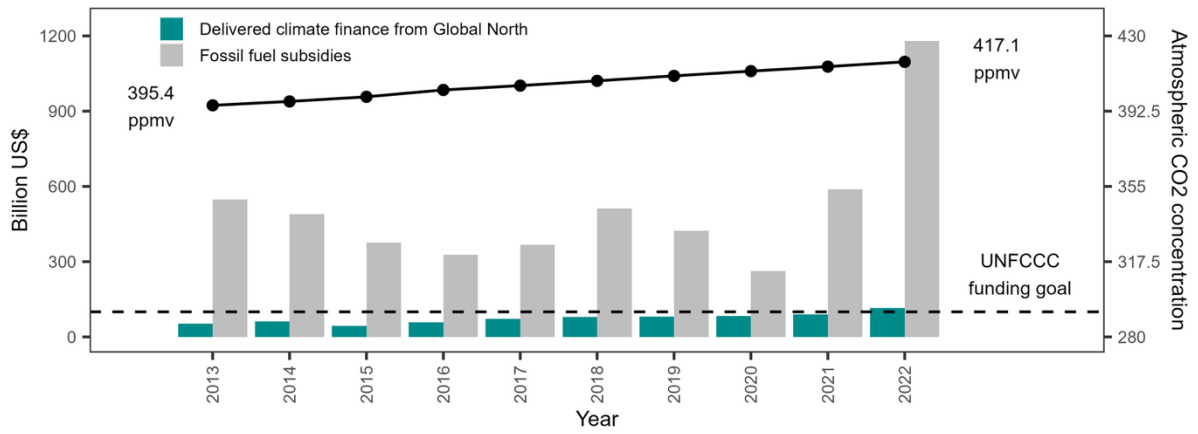

Figure 1: Delivered climate finance from the Global North[15] relative to fossil fuel subsidies from 2013-2022[16,17]. The dotted line shows the former UNFCCC climate funding goal of mobilizing USD 100 billion annually until 2025, which was exceeded by fossil fuel subsidies by an average factor of six. The solid line shows atmospheric CO^2-levels[18–21]. Method can be found in Appendix 1.

How current climate and biodiversity finance discourses risk driving social injustices

Global social and environmental injustices sit at the core of climate change and biodiversity loss. Countries in the Global North[1] have been the main drivers and principal beneficiaries of fossil fuel extraction and environmental destruction[22]. At the same time, communities in the Global South suffer disproportionate impacts of climate change[23] and nature degradation[24] due to higher exposure and a lack of resources for adaptation[25].This dynamic - consistent with the concept 'ecologically unequal exchange'[26,27] - exacerbates historic inequalities between the Global North and South. Simultaneously, structural inequalities within the international monetary system can lock Global South countries into development pathways that harm biodiversity[28]. For example, some governments have to rely on environmentally harmful export commodity production to earn the foreign currency necessary to service large external debts[28,29].

Despite efforts to level the playing field through UN negotiations, Global North countries have largely set the agenda and conditions for climate and biodiversity funding, with current finance flow estimates showing that a comparatively limited share of total climate finance is channeled as international finance from the Global North to the Global South **(Figure 2A)**. A large proportion of this finance is channeled in the form of new loans[30] **(Figure 2B)**, which risks further indebting already financially pressured countries and exacerbating a climatic, ecological, and economic triple crises. Least Developed Countries (LDC) and Small Island Developing States (SIDS) currently spend more than twice as much servicing debt as they receive in climate finance[31].

[1] In this paper we use the terminology "Global North" and "Global South" to refer to countries who have been the main drivers and beneficiaries of fossil fuel dependent development, and those who are specifically vulnerable to its impacts, respectively. We acknowledge that this division between countries is imperfect, and that it ignores many dimensions of global political relations.

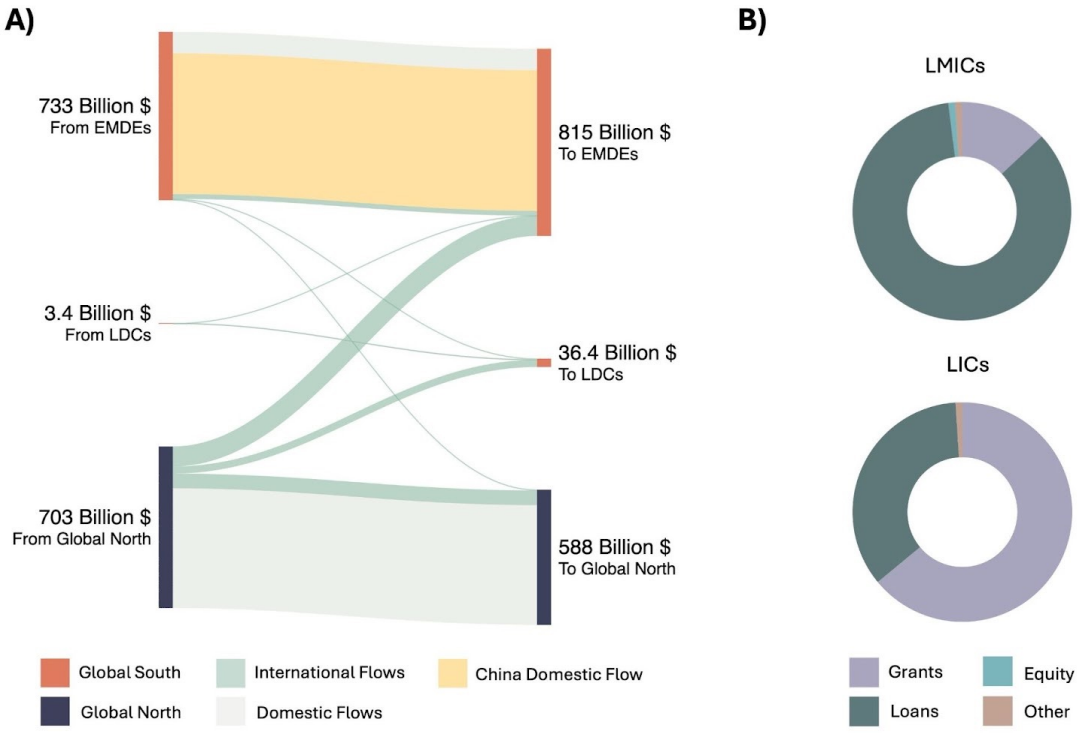

Figure 2: A) Global climate finance flows in 2022[32]. Economies are grouped as 'EMDEs' (Emerging Markets and Developing Economies) using the IMF World Economic Outlook classification[33] 'LDCs' (Least Developed Countries) using the UNCTAD classification[34] and "Global North". Grey flows represent domestic financial flows within each group, while green flows indicate international climate finance both within and between groups. China is highlighted in orange, as it accounted for 72% of all climate finance directed towards EMDEs in 2022 (42% of the global total). B) The estimated share of public climate finance to Low Income Countries (LICs) and Low and Middle Income Countries (LMICs) in 2013-2022[35]. Of finance to LICs 38% was loans, 61% grants, and 1% unspecified; for LMICs, 86% was loans, 13% grants, and 1% equity. Expanded methodology can be found in Appendix 1.

Looking beyond international inequities, current climate and biodiversity finance trajectories also risk promoting inequity between public and private finance, skewing the finance landscape towards socialization of financial risks and privatization of gains. Within blended finance structures, public finance is often used to de-risk private investments, for example by absorbing first losses. These financial mechanisms are important for increasing private finance in environmental assets, but comes with risks that tax-payers cover losses and risks while private actors can capture a larger share of the financial gains[36,37]. Even when private finance is leveraged as part of corporate social responsibility budgets, it is still often guided by profit-driven considerations which may shape nature outcomes in ways that are not aligned with broader societal objectives[38].

Article 6 under the Paris Agreement – which outlines frameworks for international cooperation on climate mitigation, including carbon credit trading mechanisms – is likely to drive more private finance into nature through carbon credit markets. While this presents important opportunities for new climate and nature finance, it is important to acknowledge that environmental markets have historically underperformed[39,40], with a recent study finding that only 25% of reviewed forest carbon credits constituted real emission reductions[41]. The lack of transparency in these markets also risks inflating measured progress towards

environmental goals, which in turn may lead to reduced speed and effectiveness of environmental action[42]. While lessons are being consolidated on how to design more credible nature markets[43,44], research is highlighting limitations of market-based mechanisms to deliver ecologically sustainable and just outcomes at scale[42], underscoring the need for public finance and support to play a leading role in climate change mitigation and environmental protection.

Trajectories in finance language over time in COP decisions under the UNFCCC

To explore how language within reports has developed over time within UNFCCC COP decision reports, we conducted a quantitative and qualitative content analysis to derive meaning from large text files. The overall aims of our content analysis were twofold: 1) to examine broad trends in how finance-related topics have evolved over time in UNFCCC COP decisions **(Figure 3A)**, and 2) to analyze specific discussions that explicitly quantified funding in USD, including funding targets, gaps, flows, specific funds, and environmentally harmful subsidies **(Figure 3B)**.

Across approximately 1.1 million words of UNFCCC COP decision text spanning 30 reports between 1995-2025, we found that finance-related terminology has become increasingly prominent, with references to specific financing mechanisms (grants, loans, equity, offsets, blended finance) growing relative to general financing terminology over the period **(Figure 3A)**. This indicates growing sophistication in the financial mechanisms proposed to mobilize funding. Eight different funds have been launched or discussed since the UNFCCC's inception *(Appendix 1)*. However, language addressing drivers of environmental harm remains marginal: across the entire UNFCCC corpus, references to harmful subsidies were referenced in financial terms only twice, and “ecocide laws” and the "polluter pays principle” was never mentioned **(Figure 3B)**. References to private sector involvement in finance discussions grew substantially over the period, while references to public finance mechanisms remained relatively stable **(Figure 3A)**. At the same time, we found limited focus on policy guidance for how to achieve the financial targets set in these conventions **(Figure 3B)**.

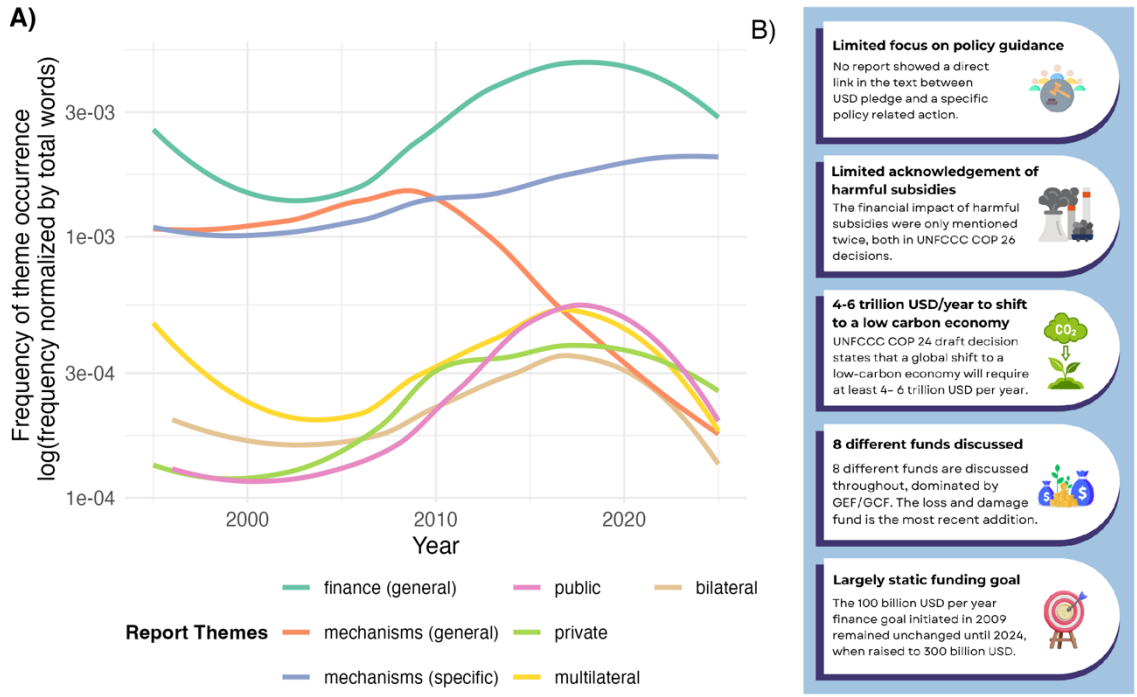

Figure 3: Summary of key findings from text analysis of UNFCCC COP decision reports between the first UNFCCC COP in 1995 and 2025. Full methodology can be found in Appendix 1.

Calls for transformative change with climate and biodiversity finance policy discourses

COP 30 in Belém closed at the end of 2025 with an agreement to launch the Belém Action Mechanism which aims to promote a just transition to a low carbon economy[45]. The IPBES Transformative Change Assessment was finalized a few months prior and highlights the need for transformative changes that addresses underlying causes of biodiversity loss and better aligns policies with views, structures, and practices that already are prominent amongst many local communities and Indigenous groups[46,47]. Most recently, the CBD 16 decision stated the need to equitably eliminate, phase out, or reform incentives that are harmful for biodiversity. Simultaneously, several scholars are calling for transformative change to bend the curve of climate change and biodiversity loss in alignment wider justice objectives[5,47–49].

This current momentum could mark the beginning of a new discourse within environmental policy that is centered on social justice and addresses the underlying drivers of climate change and biodiversity loss. Yet, despite the growing policy focus on transformative change, how such change can be operationalized in practice has received less attention[49,50]. Funding mobilization still dominates UNFCCC COP decision reports, aligning with a recent investigation of over 3000 scientific studies linked to the Sustainable Development Goals (SDGs) which found that the SDGs have had limited transformative impact on institutions[51]. A growing body of research highlights how current policy discourses around closing funding gaps derail attention from the structural shifts needed to address climate change and nature loss[3,5,8], while some media narratives increasingly question the value and efficacy of COPs to drive meaningful change[52,53]. We argue that the UNFCCC and CBD COPs remain important forums for sustaining momentum and promoting coordination on climate and biodiversity topics, yet their core economic policy focus needs to be reconsidered to better promote alignment of global economic activities with planetary boundaries and social justice objectives.

Below, we outline five key focus areas for global environmental policy to more effectively promote transformative change within climate and biodiversity finance discourses **(Figure 4)**; 1) *Stronger guidance on subsidy reforms to shift harmful financial flows*, 2) *Stronger regulations holding financial actors accountable to environmental harm*, 3) *Re-examining the legal landscape for environmental policy change,* 4) *Increase focus on debt justice*, and 5) *Improve focus on easier access to mobilized finance*. Aligning biodiversity finance policy with social justice requires a holistic view of finance flows in the broader economy, and we recognize that many of the reforms we propose have little precedent. Different interventions will play out differently in different contexts, and more research is needed on how transformative change can be equitably operationalized in different context. Yet, we highlight these five areas as priorities for further research and policy experimentation to promote more equitable and impactful UNFCCC and CBD COP finance outcomes.

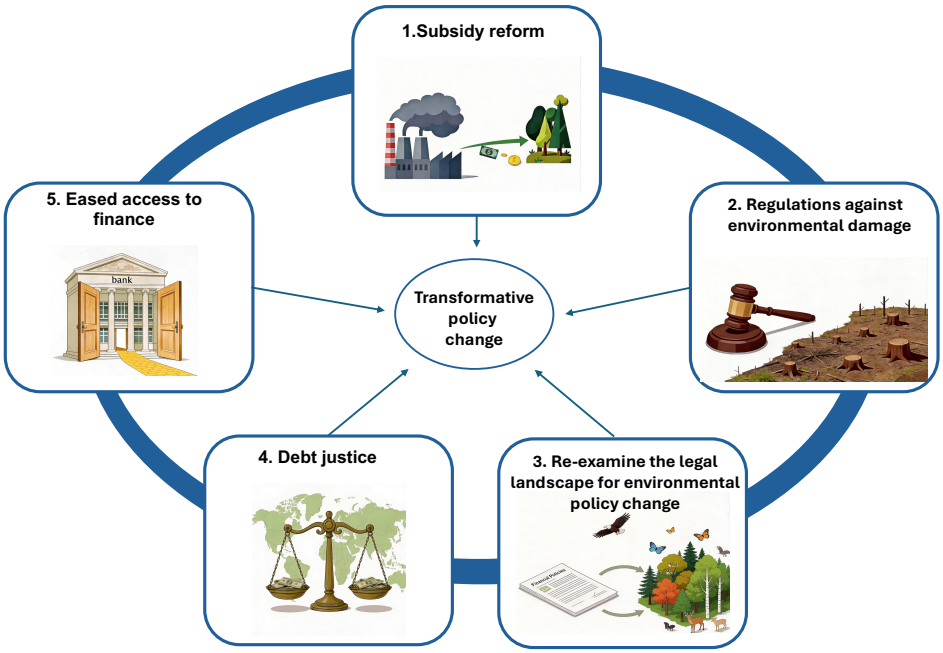

Figure 4: A framework for operationalizing transformative change within climate and biodiversity finance policy. Icons created with AI and used with permission from *freepik.com*

A framework for operationalizing transformative change within climate and biodiversity finance policy

1. *Enable stronger guidance on subsidy reforms to shift harmful financial flows*

Curbing the financial flows that drive climate change and biodiversity loss is among the most urgent tasks in environmental finance policy today. Current mobilized climate and biodiversity finance face substantial counter-pressure which undermines their efficacy, illustrated by fossil fuel subsidies which systematically have exceeded delivered climate finance by several orders of magnitude **(Figure 1)**. Similarly, despite strong scientific evidence that shifts towards plant-based food systems are pivotal to reach global emissions targets[54] a recent study found that 80% of agricultural subsidies under the European Union's Common Agricultural Policy supported emission-heavy livestock commodities[55]. This type of subsidy structures repeatedly undermines progress towards environmental targets.

Well-tailored subsidy reforms have strong potential to address climate change and ecological decline in that they both mitigate the financial counter-pressure against climate and biodiversity finance, whilst freeing up fiscal space for additional climate and biodiversity investments[56] . The Kunming-Montreal Global Biodiversity Framework (GBF), adopted in 2022, sets targets for the removal of harmful subsidies, and in 2024 the CBD 16 in Cali endorsed the need for equitable subsidy reform. However, across all UNFCCC COP reports, harmful subsidies were referenced in financial terms only twice, both times in the COP 26 decision (*Appendix 1*). Removing environmentally harmful subsidies was one of the unmet Aichi targets, and a recent study finds that while fossil fuel subsidy reforms are becoming more commonplace and more ambitious, more than 91% of the reforms in the studied sample failed within 3 years[57], highlighting the challenging nature of such fiscal reforms. Currently, UNFCCC COP decision reports provide limited guidance on how to implement subsidy reforms in a sustainable, equitable, and politically feasible way, highlighting this as an important area for future policy focus.

Despite the complexities and inherent imperfections of subsidy reform, a growing number of countries have managed to repurpose environmentally harmful subsidies. These

types of efforts can provide important precedence for future policy efforts to follow. In 2013, Denmark reduced pesticide use by 40% by linking pesticide taxes to their environmental and health impacts and channeling the generated revenue into farmer compensation and environmental programs[58]. Emerging economies grappling with rural poverty can also promote just outcomes alongside attempts at subsidy reform; Zambia removed fossil fuel subsidies in 2023, directing revenue from this intervention to social programs and helping enable free public schooling[58] and India has started to provide unconditional basic payments to farmers alongside incentives for states to cut fertilizer subsidies by passing half of the savings back to individuals as grants[59]. Similarly, Colombia has banned new fossil fuel licenses and negotiated a people-first subsidy transition directly with oil workers, demonstrating that even structurally fossil-fuel-dependent economies can pursue ambitious reform[60].

Subsidy reforms are often politically challenging, with incumbent industries lobbying to maintain support - since 2005, fossil fuel interest groups have spent 954 million USD lobbying the U.S. government on carbon capture-related policies alone[61]. This highlights the need for the Rio Conventions to increase attention on how lobbying activities can obstruct reform efforts. At the same time, if removal of harmful subsidies is implemented in a supportive and stringent regulatory framework, it can also benefit private actors. By leveling the playing field between market participants and removing the first-mover disadvantage, these reforms can support firms that are advancing their sustainable practices[62]. Rio Convention finance forums can play a key role by assessing the long-term effects of such reforms and building an evidence base on pathways towards politically acceptable and socially just subsidy reform in different contexts. Importantly, subsidy reform needs to be carefully implemented to ensure that subsidy shifts do not come with equity risks for vulnerable groups[49].

2. *Strengthen regulations to hold financial actors accountable for environmental harm*

Alongside public subsidy reform, efforts to shift investments away from assets that drive climate change and biodiversity loss are important focal areas for upcoming Rio Convention finance discussions. Despite the substantial contribution of corporate actors to environmental crises, UNFCCC decision reports provide limited guidance on accountability mechanisms. While Article 2.1c in the Paris Agreement and Goal D of the Kunming-Montreal GBF raise the need for aligning financial systems with the wider goals of the agreement, these reports generally use broad language and lack clear implementation pathways. Moreover, no UNFCCC reports established a link between a USD pledge and specific policy actions (*Appendix 1*). Future policy developments could build on these foundations by providing clearer guidance on how these ambitions can be translated into action.

For transformative change to be operationalized, stronger focus is required on policy initiatives that align financial flows with climate and biodiversity targets. This includes increased focus on how legally binding regulations, such as polluter pays mechanisms and ecocide laws (not mentioned across the entire three-decade corpus of UNFCCC decisions; *Appendix 1*) can be designed to hold financial actors accountable for social and environmental harms. Historical precedents illustrate that implementation of such regulations are possible. A well-known success story is the Montreal Protocol[46] which enabled recovery of the ozone layer through strict penalties for using ozone-depleting substances. Cases like these can inform future legally binding commitments.

While governments must take the lead on transition pathways in environmentally harmful sectors, financial policy makers such as central banks, supervisors, and regulators

have an important coordinating role to play in ensuring that private financial flows align with broader environmental policy ambitions[63]. Financial regulators could enforce mandatory environmental risk disclosures and higher capital requirements on financing activities contributing to systemic environmental risks. However, while disclosure systems can increase transparency of biodiversity-related finance flows, the effect such frameworks have on actually re-directing investments are unclear[64] . Concerns have further been raised that policy attention towards disclosure of finance-related biodiversity risks can come at the expense of stronger regulatory interventions to mitigate biodiversity loss[65]. This underscores the importance of coupling disclosure frameworks with legally binding regulations and targeted support to shift investment patterns that risk driving biodiversity loss and climate change.

Effective financial regulation also requires careful coordination to mitigate regulatory arbitrage and to ensure the wind-down of environmentally harmful sectors supports workers and communities. Without coordinated reporting standards across major financial markets, divestment risks simply shifting harmful financing into less transparent corners of the financial system, such as private equity. Effective regulation would therefore require detailed disclosure at the level of individual funds and account for environmental impacts alongside financial risks[66]. Coordinated efforts of this kind will be essential for ensuring that accountability mechanisms deliver real environmental outcomes instead of simply reshuffling harmful investments. The Rio Conventions can promote transformative change in these sectors by providing guidance on how such coordination can be executed in practice.

3. *Re-examine the legal landscape for environmental policy change*

Shifting harmful environmental financial flows further requires better alignment between environmental targets and wider policy frameworks. Hidden policy incoherences can undermine even well-funded and supported interventions. For example, one study found that local community members in Panama were hesitant to participate in REDD+ as the constitution implies that land rights may be lost if land is not cultivated[67]. These types of policy incoherences are often not obvious but can be addressed if the environmental policy framework – in this case as REDD+ – provides guidance on how to combine conservation or restoration projects with productive elements. Similarly, an assessment of global constraints to implement Natural Climate Solutions (NCS) projects found that lack of policy coordination or implementation capacity was among the main constraints to implementing NCS projects, and the authors suggest that increased funding for NCS may be best directed towards enabling conditions such as addressing regulatory, legal, and policy constraints[68]. Other research finds that a driver of subsistence deforestation by some Indigenous communities stems from a need to send children to distant schools or cover health expenses in far-away clinics[69]. Indeed, districts in the Peruvian Amazon that spent more on social programs such as health care, sanitation, and education experienced lower deforestation, partially because a stronger social net reduced the attractiveness of agricultural expansion[70]. These findings highlight the agency that governments have in using public finance to address drivers of climate change and environmental degradation whilst simultaneously advancing on social objectives.

Certain financial policies can also directly undermine environmental targets. Environmental policy negotiated at multilateral forums such as the COPs under the UNFCCC and CBD is often constrained by economic policy negotiated within financial decision-making forums (e.g., the World Trade Organization (WTO), and the International Monetary Fund (IMF)) where Global North countries wields outsized power. Stronger coordination between these institutions will be pivotal for transformative change within COP forums. For example, the Investor-State Dispute Settlement (ISDS) is a mechanism that allows foreign investors to sue host states that alter the regulatory operating environment under which the

investment was initially made. The aim of the ISDS is to attract investment to areas investors may deem risky, but burden of potential law suits falls disproportionately on Global South governments hosting foreign investors in extractive industries[71]. This can create a 'regulatory chill' whereby governments become hesitant to adopt climate and biodiversity policies for fear of litigation costs, posing a direct barrier to aligning financial flows with environmental objectives. In a dispute with a mining company, El Salvador spent approximately its entire annual environmental budget defending the case over seven years[72].

The ISDS is one of several economic tools - alongside sanctions and dollar-denominated debt (which we explore below) - that can take precedence over environmental decisions, highlighting the need for Rio Conventions to focus on engaging in deeper discussion on how to reform current international treaty mechanisms like the ISDS that can undermine both environmental progress and global social justice. Yet, reform efforts must proceed pragmatically. International arbitration, including ISDS, can provide valuable de-risking by offering a neutral forum for resolving disputes. Governments often balance the need for investment inflows with the preservation of domestic environmental regulatory autonomy. One potential pathway could involve internationally supported mechanisms to share the costs of arbitration in cases involving environmental policy change, maintaining a stabilizing framework for investors while reducing the risk that states are financially deterred from promoting stronger environmental regulations.

4. *Increase focus on debt justice*

The current international monetary system is characterized by asymmetric rules and conditions that can make sustainable development pathways in some Global South countries very difficult. Many Global South countries struggle with high levels of sovereign debt, often emerging from historical injustices and made with unfavorable lending conditions, frequently to the same countries that have driven and benefitted most from the fossil fuel economy and environmental degradation[73,74]. The vast majority of foreign debt is held in U.S. dollars, and the easiest and fastest way for countries to gain the U.S. dollars necessary to service debt is through extracting natural resources for exports[28]. Because of unequal power relations within the international monetary system, most of the financial profits from these natural resources are captured by Global North actors, while the environmental damage and loss of climate change resilience remain in the Global South[75]. Credit rating agencies may then downgrade countries for their exposure to climate-related risks, increasing the cost of servicing debt in a vicious cycle[76]. High interest payments on debts can therefore drive climate change and biodiversity loss whilst impeding Global South countries from developing economies resilient to environmental shocks. This is especially concerning as countries at greatest risk of debt distress often are the most vulnerable to climate disasters, despite having contributed the least to historical CO_2 emissions per capita **(Figure 5)**. Given the important relationship between sovereign debt levels, environmental degradation, and environmental resilience, debt forgiveness and other structural debt reforms are critically important focal areas for upcoming Rio Convention conversations. Such interventions could unlock substantial funding to enable domestic policy autonomy; 48 of the countries in highest risk of debt-distress hold a cumulative external debt of ~$605 billion, more than 75% of the ~$790 billion they require to meet their Paris Agreement targets[77].

Debt-for-nature swaps, a form of conditional debt relief that reduces a country's debt burden in exchange for specific environmental commitments[78] are among the most discussed approaches. But whilst successful in some cases, these swaps often struggle with high transaction costs[8] and attaching conditions to debt relief is ethically complex and can undermine the fiscal sovereignty of debtor countries. Yet, well-designed debt reform can give

highly indebted countries in the Global South greater autonomy to invest in nature protection and climate mitigation in ways that reflect their own contexts and objectives.

Strengthening financial legislation in Global North countries around responsible lending will also play a critical role. Greater efforts need to be placed on how activities of institutions such as the World Bank and the International Monetary Fund (IMF) affect environmental outcomes. A recent study found that IMF loans were, on average, linked to a 9.2 percent increase in annual deforestation[79], while IMF lending conditionalities (i.e., the conditions attached to a lending agreement) have been shown to weaken recipient countries' ability to adapt to climate change in some circumstances[80]. Increased focus on tax justice is equally important; governments globally lose an estimated half a trillion USD yearly to tax evasion[81], and a 2018 study found that the majority of deforestation-driving finance investigated was transferred through tax havens[82]. More research and policy focus are needed on how to design debt relief mechanisms that can deliver long-term autonomous outcomes, and how institutions such as the IMF can better support just debt relief transitions aligned with broader climate and nature objectives. While countries under less economic distress are better positioned to promote nature conservation and climate action, there is no guarantee these governments will use newly freed-up fiscal space from debt reforms for these purposes. Debt relief will therefore be best implemented when combined with subsidy reforms and other measures that promote climate and nature friendly development pathways.

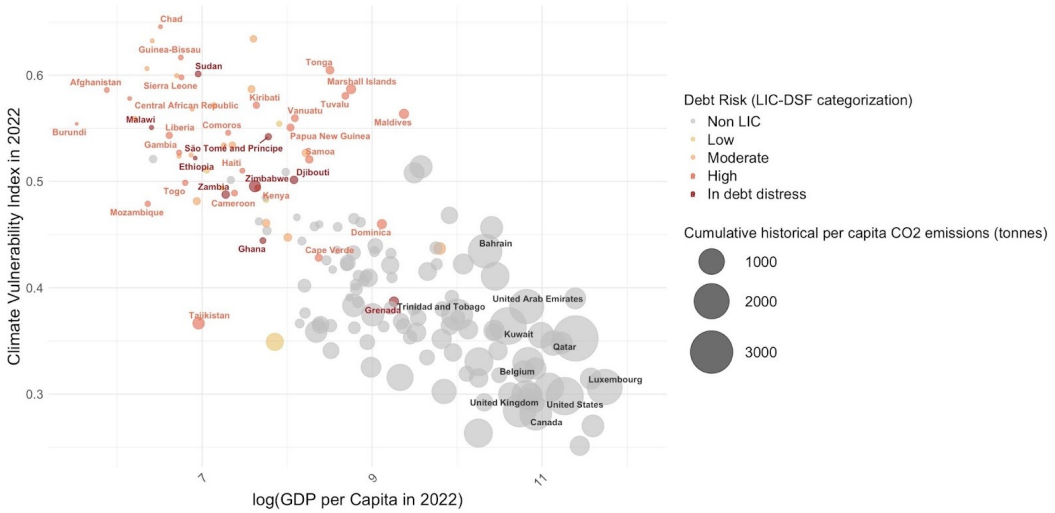

Figure 5: Relationship between GDP (log-transformed, 2022)[83], climate vulnerability[84] , risk of debt distress[85], and historic responsibility for CO^2 emissions[86,87]. Point size reflects cumulative historical per capita CO^2 emissions; the top 10 historical emitters are labeled. Countries currently in debt distress (red) or at high risk of debt distress (orange) are generally the most climate-vulnerable and the least responsible for historical emissions. Methods described in Appendix 1.

5. *Promote easier access to mobilized finance*

Even after promoting the broader economic interventions proposed here, the urgent need to mobilize new biodiversity and climate funding will remain imperative in enabling transformative change[49]. Mobilizing and deploying sufficient funds has been challenging to date, and determining how to improve these finance pathways is an important focus for upcoming climate and biodiversity policy dialogues. Projects aimed to support IPLCs tenure and forest management received less than equivalent to one percent of Official Development Assistance leveraged for climate change mitigation and adaptation between 2011-2020[88], and efficient frameworks to channel resources directly to these groups remain largely absent[89]. At the same time, IPLCs are increasingly recognized in as frontline actors of transformative

change, and IPLCs knowledge and practices will play a pivotal role in informing how structural economic shifts can be operationalized[47].

The strong reliance on loans in current climate finance discourses (as illustrated in **Figure 2**) risks deepening the debt crisis and locking recipient countries into renewed cycles of interest payments. That concessional finance is the main funding source for LICs is promising; grants, interest-free loans, or loans that become grants if targets are achieved, may promote more effective and equitable outcomes. Greater policy attention within Rio Conventions is needed on how to design financial instruments that better align development objectives with climate and biodiversity goals. Recent reported growth in biodiversity finance can partly be attributed to new ways of conceptualizing what counts as biodiversity finance[8], underscoring the need for greater transparency in how finance flows are measured and how different types of finance affect social and environmental outcomes.

Access to finance for Indigenous Peoples and Local Communities (IPLCs) remains a major barrier to successful and equitable deployment of funds. Application processes are often highly bureaucratic, costly, and lengthy, and a fragmented landscape of commitments and funds makes it difficult to tackle these challenges holistically. Since the first COP under the UNFCCC, eight different funds have been launched or discussed (Figure 3; *Appendix 1*). However, the coherence among these funds is currently unclear, and future COPs can explore how and when these funds can complement and collaborate with each other,

Multilateral donors such as the Global Environmental Facility (GEF) and fund-hosting institutions like UNEP have an important role to play in simplifying the application process and improving access to funds. These changes will require closer collaboration among the finance commitments made across the Rio Conventions to bridge silos and promote synergies across funding vehicles[90]. Both the CBD and UNCCD have made decisions promoting direct funding access for IPLCs, providing precedence for UNFCCC to follow. We still do not know what effect these decisions will have in practice, and many barriers remain, including the need for increased investments in capacity building and reduced technical requirements in funding applications. Enhanced monitoring of both fund disbursement and associated social and environmental outcomes is essential to ensure commitments translate to action. Noteworthy is the Forest Tenure Funders Group (FTFG), established after COP26 with the aim to track progress towards the goal of mobilizing 1.7 billion to support IPLCs in securing tenure and protecting forests [91].

Whilst increased focus on funding access is imperative, procedural equity in Rio Convention governance processes around finance is equally important. Outcomes from COP negotiations can never be truly just unless the processes by which decisions are made are just too, and increased focus on procedural equity in environmental policy can help shift agenda-setting power to those most affected by climate change and biodiversity loss but who have been systematically marginalized in decision-making[92–94]. In practice, this can mean increased exploration of how to strengthen decision-making influence in climate and biodiversity finance policy for the countries who are most affected by climate change and biodiversity loss.

A new climate and biodiversity finance era of transformative change

Recent developments within UNFCCC and CBD policy dialogues signal growing recognition that transformative change - alongside incremental funding mobilization - is needed to address the intertwined climate and biodiversity crises. Yet, our analysis of three decades of UNFCCC decision text reveals a persistent disconnect: finance discourse remains anchored in mobilization targets while the macroeconomic drivers of environmental degradation receive comparatively less attention. The five interventions outlined here offer a framework for reorienting this discourse toward addressing root causes of climate change and biodiversity

loss, from subsidy reform and financial accountability, to debt justice and equitable access to finance.

We recognize that many of these interventions extend beyond what Rio Convention forums can deliver alone. Subsidy reform guidance and improved finance access can fall within Rio Convention mandates, but systemic changes to debt structures, trade law, and financial regulation require coordinated action across institutions including the IMF, World Bank, and WTO and national governments. Rio Conventions can provide the political legitimacy and stakeholder convening power to catalyze these reforms, but implementation will depend on engagement across governance forums. With 2024 marking the first-year global temperatures exceeded 1.5 degrees C, and ecological tipping points drawing closer, the window for incremental approaches is closing. Transforming environmental finance policy beyond its current focus on funding mobilization into a vehicle for structural economic change is no longer aspirational, it is imperative for a socially just and sustainable future.

Author contributions:
Conceptualization and writing of the manuscript were led by SL, with key input from GD, SOSEzE, LKW, BST, HC, and JS, and with support of all authors. The UNFCCC COP corpus analysis was designed and carried out by LKW, assisted by SL; SOSEzE conceived the initial idea for the analysis. Figure 1 was designed by SL, JE, and GD. Figure 2 was designed by GD and EA with input from SL, LKW, SOSEzE, JE, HC, and LX. Figure 3 was created by LKW and SL. The analysis and visualization of Figure 4 was created by EA and GD with input from SL, LKW, SOSEzE, JE, HC and LX; the idea for the analysis was conceived by LX. Figure 5 was created by SL.

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Conflicts of interests:
S.L. co-chairs the Technical Advisory Board of Equitable Earth. PHSB is partner at re.green, a forest restoration company that trades carbon credits. NC is the panel member for climate change mitigation on the GEF's independent Scientific and Technical Advisory Panel. DD is an advisor to the restoration company Ponterra. WP works for one of the signatories to the FTFG Cop 26 pledge, and her contribution to this paper does not represent the views of the foundation. S.S. is an investor at Just Climate LLP, and his contribution to this paper does not represent the views of the organization nor does it have any impact on its activities. L.K.W. is

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Appendix 1: Supplementary material for - *Catalyzing transformative change for climate and biodiversity finance within COP policy discourses*

Supplementary methods:

Figure panel (1) methods:

To create figure (1) we compiled data from various sources to show an overview of annual delivered climate finance and fossil fuel subsidies in relation to increase in atmospheric carbon accumulation and the UNFCCC climate finance goal.

For (1), data for yearly climate finance was extracted from the OECD report *Climate Finance Provided and Mobilised by Developed Countries in 2013-2022*[1]. The data for fossil fuel subsidies was detracted from OurWorldinData (Ritchie 2025), which summarized data from International Energy Agency (2024). The data for atmospheric carbon accumulation was extracted from OurWorldinData (2025), which summarized and processed data from the National Oceanic and Atmospheric Administration (NOAA, 2025), Lan et al. (2025), and the United States Environmental Protection Agency (2024).

Figure panels (2) methods:

To create figures (1)-(2) we compiled data from various sources to create three figures showing: (1) An overview of annual delivered climate finance and fossil fuel subsidies in relation to increase in atmospheric carbon accumulation, (2A) global climate finance flows between EMDEs, LDCs, and the Global North in 2022 and (2B) Instrument split of public climate finance provided across developing country regions and income groups in 2016-2020.

For panel (2A), which visualizes global climate finance flows between economic regions in 2022, data was extracted from tables A.9 and A.11 source data for the *Global Landscape of Climate Finance 2024* (CPI, 2024). We used this report as it includes extensive data on climate finance flows (e.g., OECD, 2023) and is used by various other noteworthy reports (e.g., IHLEG, 2024). The report classifies economies into two primary groups: emerging markets and developing economies (EMDEs), and advanced economies, based on the IMF World Economic Outlook classification (IMF, 2023) It further categorizes least developed countries (LDCs) using the UNCTAD classification (UNCTAD, 2024). To match the terminology used throughout the article, in this panel we denoted Advanced economies as 'Global North'. The panel also highlights domestic climate finance flows within China, which constitute a significant portion of the finance directed toward EMDEs. Flows from unknown sources were excluded for clarity. The Sankey diagram was generated with SankeyMATIC (https://sankeymatic.com/).

Additionally, the estimated distribution of various financial instruments within public climate finance provided to Low and Middle Income Countries (LMICS) and Low Income Countries (LICs) between 2016-2020 is presented in two donut charts in panel (2B), and uses data from the OECD report *Climate Finance Provided and Mobilised by Developed Countries in 2016-2020: Insights from Disaggregated Analysis* (OECD, 2022).

UNFCCC decision report analysis (Figure 3 and in-text references):

To summarize the focus of historic United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP) discussions we conducted a qualitative content analysis (Krippendorff, 2019) to derive meaning from large text files (i.e., all UNFCCC COP decision reports from 1995-2025). The overall aims for our content analysis were twofold: (1) to examine broad trends in how finance-related topics have evolved over time in COP decisions (Figure 3A), and (2) to analyze specific discussions that explicitly quantified funding in USD, including funding targets, gaps, flows, specific funds, and harmful subsidies (Figure 3B). While *Aim 1* focuses on identifying long-term thematic patterns in financial discussions in UNFCCC decisions, *Aim 2* narrows in on numerical financial references to assess the content associated with specific funding amounts in UNFCCC decisions. All analyses were conducted in R version 4.5.0 (5lopment Core Team, 2024). Code required to reproduce the analysis and figures will be archived on Figshare.

Data sources and quality control:

We first downloaded all UNFCCC COP decisions as machine-readable PDFs available as of Dec 9, 2025, to serve as the corpus for our analysis (UNFCCC: https://unfccc.int/decisions). As of this date, the 2025 UNFCCC decisions (COP 30) were still in draft format, but we included them to ensure our analysis reflected the most up-to-date information. We only used final decision reports; however, we acknowledge that a decision report does not mean full endorsement by all member states, and that power imbalances between countries likely resulted in some countries having a stronger influence over the outcome of decision reports than others. We checked all downloaded PDFs for encoding errors using the *pdftools* package and re-encoded one corrupted PDF to enable accurate text extraction.

Pre-screening, familiarization with data, and search term selection:

Before starting the analysis, we read an even mix of UNFCCC decision reports distributed across years (n = 15 reports total) to familiarize ourselves with the report language and content. During this pre-screening, we identified and listed terms relevant to our tentative research questions for *Aim 2*. These terms were then grouped into five focus themes for coding in the *Aim 2* analysis (see below for details): policy focus, public vs. private focus, financial pressures, subsidies, and specific funds. Based on this pre-screening, we also included "USD" as a search term, as we found it to be currency used in UNFCCC reports when detailing funding gaps, pledges, financial flows, and the impact of harmful subsidies, which are central to *Aim* 2.

Extracting text for quantitative content analysis:

To conduct our content analysis, we first cleaned all extracted PDF text to fix encoding issues such as incorrect dashes and quotation marks. We then calculated the total word count for each PDF to normalize term occurrences by document length. To do so, we tokenized the text using ICU-defined word boundaries (*stringi* package), removed tokens that were numeric, non-alphabetic, or shorter than two characters (except for valid single-character words like “a” or “I”), then counted the total number of remaining tokens as words. Next, we split the text into sentences and applied a specified list of search terms (*see below*) to identify and extract sentences containing these terms. To capture the full context for *Aim 2,* we also included the preceding and succeeding sentences when extracting relevant matches. The final content analysis dataframe contained the following key variables:

- Metadata – Includes the year, document type (i.e., UNFCCC), document number, and total word count of each COP decision document.
- Extracted sentence context – The sentence containing the matched search term, along with the preceding and succeeding sentences.
- Matched terms – The finance-related term(s) identified within each relevant sentence (often more than one per sentence).

We used the *pdftools* package to extract text and multiple tidyverse packages were used both here and throughout (*dplyr, tidyr, purrr, stringr, tidytext, ggplot2*) for data cleaning and visualization.

Search terms:

Our search terms were selected to encompass discussion of (1) general finance, (2) general financial mechanisms, (3) specific financial mechanisms, and (4) public and private finance sources. The final list included the following terms (* indicates a wildcard search):

> "aid", "bilateral", "blended", "business", "contribut*", "credit" or "credits", "debt*", "donat*", "donor*", "divest*", "equity*", "fical*", "finan*", "fiscal*", "fund*", "grant*", "instrumen*", "invest*", "loan*", "mechanis*", "mobiliz*", "money", "multilateral*", "official development assistance", "offset*", "ODA", "payment*", "polluter pays", "private", "public", "subsidies", "subsidy", "tax" or "taxes", and "USD"

Cleaning summarized text, standardizing relevant terms and creating theme categories:

To ensure consistency within the search terms, we first removed trailing letters and numbers from matched terms and filtered out irrelevant terms that appeared infrequently due to wildcard searches (*e.g.,* variations of "fundamental" and "investigate"). To focus on finance-related topics, we excluded instances where "public" or "private" appeared in isolation, retaining only those that co-occurred with other finance-related search terms. This refinement reduced occurrences of "public" from 1,202 to 549 and "private" from 860 to 520, significantly narrowing the dataset to finance-related content. Next, we standardized extracted terms using lemmatization (*textstem* package), converting words to their base forms (*e.g.,* "donations" → "donate"). When lemmatization was insufficient, we manually grouped similar terms under a common root (*e.g.,* "investor," "investing," "invested" → "investment"; "mobilization" → "mobilize"; “financial”, “finance”, “money” → “finance”), and expanded all abbreviations (e.g., “ODA,” “official development assistance” → “official development assistance”). This process resulted in 28 final relevant terms:

> "aid", "bilateral", "blended", "business", "contribute", "credit", "debt", "donate", "equity", "finance", "fiscal", "fund", "grant", "instrument", "investment", "loan", "mechanism", "mobilize", "multilateral", "official development assistance", "offset", "payment", “polluter pays”, "private", "public", "subsidy", "tax", "USD"

Finally, we created a categorical variable grouping these 27 search terms (except "USD", which was only used for *Aim 2*) into five broad categories for ease of plotting and interpretation:

- finance (general) → "contribute", "fiscal", "finance", "mobilize"
- mechanisms (general) → "instrument", "mechanism", "payment"
- mechanisms (specific) → "aid", "blended", "business", "credit", "debt", "donate", "equity", "fund", "grant", "investment", "loan", "offset", "official development assistance", "polluter pays", "subsidy", "tax”
- public sector references → "public"
- private sector references → "private"
- multilateral references → “multilateral”
- bilateral references → “bilateral”

Summarizing finance-related discussion in COP decisions over time for (Aim 1):

To assess how finance-related topics have been discussed over time in COP decisions, we (1) analyzed the frequency of finance-related terms and (2) visualized their occurrence trends. Term occurrences were normalized by document length to account for year-to-year variations in COP decision report length.

First, we expanded the matched terms column (containing the 27 relevant terms) to count each term separately, grouping by year to calculate total occurrences. To adjust for differences in decision length year-to-year, term frequencies were normalized per million words. We then averaged term frequencies across all years for each of the 27 search terms, ranking them by their frequency per million words. Table S1 presents the frequency of each finance-related term over the whole time period, providing a complete overview of term distribution, including cases where a term did not appear.

Next, we summarized annual term frequencies by normalizing occurrences per total words per year. We expanded both the broad category column (containing five categories) and the matched term column (containing all 27 terms) to count each category and term separately. Term frequencies were normalized by dividing occurrences by the total words per year in COP decision reports. We then visualized trends by plotting the log-normalized frequency of the five categories (Figure 3A) and the top 10 most frequently occurring terms (Figure S1) over time for UNFCCC decisions. A LOESS smoother was applied to illustrate general trajectories in usage over time.

Summarizing Discussions that Explicitly Quantified Funding in USD

Our final cleaned content analysis dataframe contained all instances where "USD" appeared in a sentence across all UNFCCC reports (n = 291), which we used to examine how funding gaps, pledges, financial flows, and the impact of harmful subsidies were referenced in UNFCCC COP decisions. We reviewed each occurrence, including the preceding and succeeding sentences, to assess

how USD-denominated financial figures were framed within broader COP discussions. In cases where these three sentences did not provide sufficient context – such as when the text was short or extracted from a table – we referred to the full page of the original PDF document. For each instance where "USD" was explicitly linked to a funding gap, pledge, or financial flows (n = 98), we extracted the amount of funding, whether it referred to a yearly or total sum, and the year of reference (which did not always align with the year of the decision). We then manually coded each occurrence into categories based on whether it referenced a funding target, financial commitment, gap, flow, other financial mechanism, or the estimated impact of harmful subsidies. Additionally, we noted whether the reference was associated with a specific fund (fund name extracted), a policy instrument (yes/no), or an effort to reduce broader financial pressures (yes/no). Finally, we summarized what we identified to be key content themes relevant to aim, such as the persistence of the 100 billion USD target over multiple decades and presented these findings in in Figure 2B and the manuscript text.

Figure panel (5) methods:

Figure panel (5) explores the relationship between country-level 2022 Gross Domestic Product (GDP) per capita, and 2022 Climate Vulnerability, plotted as a scatterplot (*ggplot2* package in R) (R Development Core Team, 2025), and debt distress using the latest Debt Sustainability Analyses (DSAs), which assess the risk of debt distress for low-income countries (World Bank, 2025b). To represent the country-level climate vulnerability, we used the vulnerability score of the ND-GAIN Country Index (University of Notre-Dame, 2025). We used the index for 2022, which is the latest year available. The index assesses a country's vulnerability to the adverse impacts of climate change by examining six essential sectors: food, water, health, ecosystem services, human habitat, and infrastructure. GDP per capita data for 2022, which corresponds to the gross domestic product divided by midyear population, was sourced by WorldBank from the OECD National Accounts data files (World Bank, 2025a).

Data on total cumulative per capita CO_2 emissions until 2022 was generated using data compiled in the Global Carbon Budget (Global Carbon Project, 2024) and processed by Our World in Data (Our World in Data, 2024). The data was grouped per country and summed over all available years to obtain historical per capita emissions. The dataset includes only territorial emissions, not emissions associated with international trade, such as those embedded in imported goods. Additionally, emissions from international aviation and shipping are excluded from country-specific data.

Finally, we classified the debt distress ratings for each country using the latest Debt Sustainability Analyses (DSAs), which assess the risk of debt distress for low-income countries (World Bank, 2025b). These ratings are made using the Joint Bank-Fund Debt Sustainability Framework for Low-Income Countries (LIC-DSF), which categorizes countries into risk categories: "Low," "Moderate," "High," or "In Debt Distress". These analyses consider a country's fiscal position, growth potential, and debt-to-GDP ratio, providing insights into their ability to manage debt in the face of potential economic shocks. Countries not included in this framework are labelled as 'Non LIC'. We used aesthetic mappings to represent the debt distress level (colors) and historical CO_2 emissions per capita (point size) by country.

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Supplementary figures and tables:

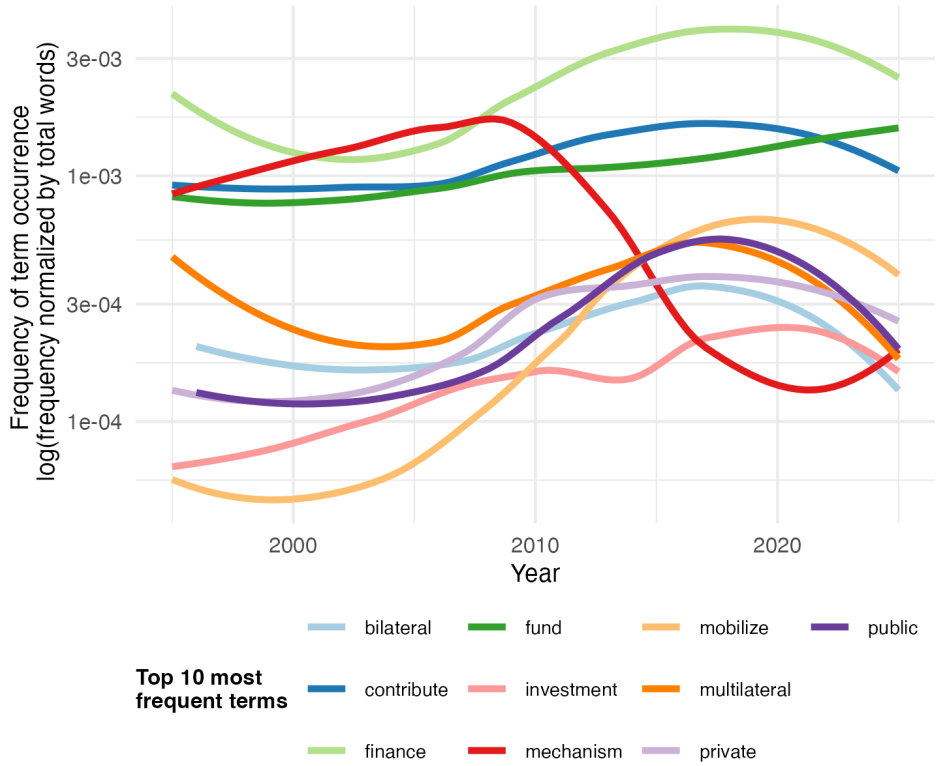

Figure S1: Timeline of the frequency of occurrence of the top 10 most frequent finance-related terms in UNFCCC decision reports (*see methods above*). Term frequency is normalized by total words in each year's COP decision report to account for differences in report length. A LOESS smoother is plotted for each theme to show the general trends of their frequency over time

COP type	term	Mean occurrence within a decision (per million words)	Total occurrences (all decisions)
UNFCCC	finance	40.07	2525
UNFCCC	fund	20.95	1062
UNFCCC	contribute	20.60	1209
UNFCCC	mechanism	15.40	1057
UNFCCC	multilateral	6.17	409
UNFCCC	mobilize	5.08	284
UNFCCC	public	4.67	292
UNFCCC	private	4.45	295
UNFCCC	bilateral	4.19	277
UNFCCC	instrument	3.30	205
UNFCCC	investment	2.89	223
UNFCCC	grant	2.28	81
UNFCCC	equity	2.23	59
UNFCCC	offset	1.28	28
UNFCCC	official development assistance	1.15	31
UNFCCC	business	1.09	61
UNFCCC	payment	1.02	45
UNFCCC	debt	0.96	8
UNFCCC	credit	0.82	19
UNFCCC	subsidy	0.74	19
UNFCCC	loan	0.69	24
UNFCCC	donate	0.66	24
UNFCCC	tax	0.59	13
UNFCCC	fiscal	0.51	21
UNFCCC	aid	0.38	4
UNFCCC	blended	0.00	0
UNFCCC	polluter pays	0.00	0

Table S1. Frequency of finance-related search terms in UNFCCC decisions, calculated as the average occurrences per one million words in annual COP decision reports, and total occurrences of each term across all decision reports. Terms are color coded to match the categories in Figure 2A