Principal–Agent Theory and Results-Based Climate Finance: A Review of Lessons from the World Bank's Initiative for Sustainable Forest Landscapes

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ABSTRACT

This review examines how Principal–Agent theory explains the performance of Results Based Climate Finance (RBCF), drawing on the World Bank's Initiative for Sustainable Forest Landscapes (ISFL) as its primary empirical case. PA theory identifies four structural risks in climate finance: adverse selection when agents overstate readiness; moral hazard when grant-funded activities lack performance discipline; multitask trade-offs when carbon metrics crowd out social and environmental co-benefits; and contract incompleteness when verification systems cannot anticipate all contingencies. Evidence from ISFL's decade-long operation confirms that results-based design — through Emission Reductions Purchase Agreements (ERPA), jurisdictional monitoring, buffer mechanisms, and Benefit Sharing Plans (BSPs) — meaningfully addresses some of these problems. Yet readiness delays, additionality uncertainty, and persistent equity tensions reveal that agency risks are restructured rather than eliminated by results-based payments. Effective climate finance requires complementary institutional reforms that distribute risks equitably, build adaptive governance capacity, and embed incentive design within broader political economy conditions that contracts alone cannot create.

Keywords: Principal-Agent theory (PA); Results Based Climate Finance (RBCF); Initiative for Sustainable Forest Landscapes (ISFL); moral hazard; adverse selection

INTRODUCTION

Climate finance has expanded rapidly over the past two decades, yet its effectiveness remains deeply contested. Billions of dollars flow annually through multilateral funds, bilateral agreements, and carbon markets toward emission reductions in developing countries, but evidence of genuine mitigation impact is uneven, and accountability mechanisms remain weak (Weikmans and Roberts, 2019; Pickering et al., 2017). The gap between climate finance commitments and verified outcomes is not simply a matter of insufficient funding or political will. It reflects something more structural: the institutional architecture through which climate finance operates systematically separates those who pay for emission reductions from those who must deliver them, creating conditions in which divergent interests and asymmetric information persistently distort outcomes.

Principal–agent (PA) theory offers a framework for understanding this problem. It explicitly models how hidden information, hidden action, and conflicting objectives shape relationships in which one party — the principal — must rely on another — the agent — to act on its behalf (Ross, 1973; Jensen and Meckling, 1976; Holmström, 1979). In climate finance, these relationships are layered. Donor governments and multilateral institutions channel funds to national governments, which depend on subnational authorities, private firms, and community organisations to implement programs. At each level, agents possess information that principals cannot easily observe and face incentives that may diverge from the principal's objectives. The result is a delegation chain in which agency problems compound rather than cancel.

What makes climate finance a particularly demanding context for PA analysis is the nature of the “good” being financed. Unlike infrastructure or health services, climate mitigation is a global public good whose benefits are

diffuse and whose production requires replacing an unobserved counterfactual. A funded wind farm only mitigates climate change if it displaces a more polluting alternative that would otherwise have been built — a condition that is logically necessary but empirically unverifiable. This counterfactual problem, as Houskeeper (2025) demonstrates, is not a measurement failure that better monitoring can fix but a structural feature of the principal–agent relationship in mitigation finance that persists even when first-order problems of waste and corruption are resolved.

Results-based climate finance (RBCF) has been promoted as a response to these challenges. By conditioning payments on independently verified outcomes rather than inputs or activities, RBCF aims to reduce information rents, sharpen accountability, and align agents' behaviour with principals' objectives (Birdsall and Savedoff, 2010; World Bank, 2017). The logic is compelling and the theoretical foundations are sound, but the empirical record from instruments like the Clean Development Mechanism (CDM), Reducing Emissions from Deforestation and forest Degradation and enhancing forest stocks (REDD+), and payments for environmental services suggests that results-based design resolves some agency problems while generating others, including delays in disbursement, adverse selection at program entry, and multitask tradeoffs that push agents toward the most measurable objectives at the expense of broader goals (Sugiyama & Michaelowa, 2001; Angelsen et al., 2012; Wunder, 2015; Streck, 2015).

This review examines these dynamics through a focus on the World Bank's Initiative for Sustainable Forest Landscapes (ISFL), a long-running results-based climate finance program currently in operation. Established in 2013, ISFL operates across five jurisdictions — Colombia, Ethiopia, Indonesia, Mexico, and Zambia — covering over 55 million hectares and combining jurisdictional-scale Measurement, Reporting, and Verification (MRV) systems, Emission Reductions Purchase Agreements (ERPA), benefit-sharing plans, and private sector engagement. Its decade-long trajectory offers an unusually rich empirical window onto how PA risks materialise in practice and how institutional design can partially but incompletely address them.

The review proceeds as follows. Section 2 develops the conceptual background, synthesising PA theory across economics, political science, and environmental policy. Section 3 describes the scope and approach of the review. Section 4 analyses how PA risks materialise in ISFL and how the program's design features address or fail to address them. Section 5 draws cross-cutting design lessons. Section 6 concludes with implications for climate finance scholarship and practice.

LITERATURE REVIEW

The principal–agent (PA) problem has long been recognised as central to understanding delegation in economics and politics. Ross (1973) introduced agency as a contractual relationship in which the agent is empowered to act on behalf of the principal, but where information asymmetries and preference divergence generate scope for opportunism. Jensen and Meckling (1976) formalised how these dynamics create "agency costs" in firms, while Holmström (1979) demonstrated how moral hazard arises when agents take hidden actions that cannot be perfectly monitored. Holmström and Milgrom (1991) further showed that multitask settings exacerbate these problems, since agents prioritise tasks that are more easily measured. Laffont and Tirole (1993) extended the framework to procurement and regulation, emphasising how incentive compatibility and monitoring shape outcomes across contracting environments.

Political scientists applied PA theory to state institutions and international organisations. Moe (1984) showed that institutional design reflects the strategic interests of those who create it, while Kiewiet and McCubbins (1991) examined legislative control of bureaucratic drift. Hawkins et al. (2009) extended these insights to international organisations such as the World Bank and the IMF, where fragmented principals struggle to monitor and sanction agents. Vaubel (2006) argued that international bureaucrats exploit inattentive principals, and Pollack (1997) documented how EU supranational institutions expand discretion under delegation. Where multiple principals with divergent preferences must coordinate oversight, the scope for opportunism compounds.

Aid effectiveness research anticipated many of the PA problems now central to climate finance. Mosley (1986) described the "micro–macro paradox," where local project success fails to generate aggregate impact. Martens et al. (2002) argued that aid agencies prioritise process compliance over outcomes when facing multiple weak

principals, while Easterly (2002) described a "cartel of good intentions" focused on disbursement rather than results. Svensson (2003) showed that conditional aid fails when donors cannot credibly monitor compliance, and Birdsall and Savedoff (2010) advanced "Cash on Delivery" aid as an explicit PA solution, conditioning payments on verified results. The fundamental challenge in both development and climate finance is the same: a principal with diffuse global interests must induce an agent with concentrated local interests to take actions whose effects are hard to verify and whose counterfactual is unobservable.

Environmental policy has drawn on PA theory to examine global governance regimes. Barrett (2005) analysed international environmental treaties as collective action problems shaped by enforcement gaps. Keohane and Victor (2011) described the fragmented "regime complex" for climate change, while Pickering, Betzold, and Skovgaard (2017) showed how institutional fragmentation generates multiple principals with divergent preferences. Weikmans and Roberts (2019) documented inconsistencies in climate finance accounting, underscoring that the architecture of global climate governance reproduces rather than resolves the conditions that make PA problems severe.

A more formally grounded treatment appears in Helm and Wirl (2014), who develop a mechanism design model in which a principal representing industrialised countries contracts with an agent representing developing countries under multilateral externalities. Their key departure from standard PA models is that both parties are affected by aggregate emissions, meaning the principal can use her own emission reductions — not just financial subsidies — as an incentive instrument. This produces counterintuitive results: countries reducing emissions by less may receive higher subsidies, and subsidies can turn negative for agents with a high willingness-to-pay who are sufficiently rewarded by the principal's own abatement. Countervailing incentives — the agent's simultaneous motives to overstate damages to extract transfers and to understate them to claim a better outside option — mean the contract binds from below, reversing the structure of standard screening models. Helm and Wirl also show that their optimal allocation can be implemented via a competitive permit market, providing a formal rationale for emissions trading as a solution to the incentive problems that transfer-based mechanisms cannot resolve.

Empirical studies of market-based mechanisms document these frictions. Sugiyama and Michaelowa (2001) showed that the CDM was vulnerable to moral hazard due to manipulable baselines. Angelsen et al. (2012) showed how REDD+ design interacts with governance capacity to generate adverse selection risks, and Wunder (2015) demonstrated how payments for environmental services face both adverse selection — payments going to actors who would have conserved anyway — and moral hazard once payments begin.

Houskeeper (2025) makes the structural tension explicit, identifying a second-order PA failure — the counterfactual problem — that persists even when first-order problems of waste and fraud are resolved. Climate mitigation requires not just that a green investment is built, but that it replaces a more polluting counterfactual. Since the counterfactual is unobserved, donors and recipients face a fundamental information asymmetry that no certification procedure can fully close. Houskeeper identifies three scenarios: the mitigation scenario, where green finance replaces brown investment; the development scenario, where it replaces no investment, generating local economic benefit but no mitigation; and the transfer scenario, where it replaces green investment the recipient would have funded independently. Rational recipients will systematically prefer the latter two, since climate mitigation is a global public good while economic development and cash transfers are local goods. Houskeeper tests this on CDM data and finds that mitigation finance reduces coal-fired capacity — where cobenefits align donor and recipient interests — but has little effect on oil or gas capacity and is associated with increased rather than decreased national emissions overall. This reframes additionality not as a measurement challenge but as an identification problem: the counterfactual is not merely unverified but unverifiable.

RBCF attempts to address these problems by conditioning payments on verified outcomes. The World Bank (2017) reviewed 74 RBCF programmes and found that ex post payments reduce information rents. Streck et al. (2015) found that results-based design resolves some PA problems but introduces others, including disbursement delays and contract incompleteness, while Karsenty et al. (2014) showed that unclear carbon rights exacerbate frictions further. RBCF cannot, however, resolve the counterfactual problem: conditioning on observed outcomes does not identify what would have happened in their absence, and additionality failure persists regardless of how rigorously payments are structured.

The PA framework applies equally to climate adaptation, though this remains underexplored. Hotte et al. (2016) examine how PA dynamics impede adaptation in British Columbia's forest sector. The provincial government, as principal, wants long-term forest resilience; private licensees, as agents, face incentives to meet minimum regulatory standards and no more. Licensees discount future climate risks at higher rates than the social discount rate, have no guaranteed stake in future timber value under volume-based tenure, and are not fully compensated for the costs of more adaptive strategies. The study finds a positive net present value for public investment in assisted migration across all scenarios tested, but no corresponding private incentive for voluntary adoption. The adaptation context inverts the standard climate finance payment relationship: the principal wants the agent to bear costs whose benefits accrue publicly over the long run, which means risk-sharing mechanisms are required rather than improved monitoring or payment design alone.

Ben Jelili (2025) extends the PA critique to central banking, arguing that the classical delegation model — in which governments mandate independent central banks to insulate monetary policy from short-term pressures — is strained by the systemic, path-dependent nature of climate risk. Climate damages feed back into financial risks, which trigger policy responses that alter emissions trajectories, creating recursive dynamics that fixed mandate PA frameworks cannot accommodate. Central banks engaged with climate risk are also not passive agents but active norm-setters, co-producing the stress-testing scenarios and taxonomies that define what climate-related financial risk means — a reflexive relationship that standard PA models treat as outside legitimate agent behaviour. Ben Jelili's macro-financial simulations calibrated to France and Germany show that proactive central bank engagement consistently improves long-term welfare and reduces emissions, but with elevated short-term transition risks, and that coordination across Eurozone central banks produces incremental gains that cannot substitute for structural decarbonisation in high-emission economies.

The literature establishes that long chains of delegation, costly monitoring, fragmented principals, and the unobservability of counterfactuals generate adverse selection, moral hazard, multitask substitution, contract incompleteness, and additionality failure as recurring features of climate governance. RBCF is a meaningful corrective but cannot resolve identification problems rooted in counterfactual unobservability. Risk misalignment in adaptation requires redistribution of costs and risks, not only improved payment design. And where agents co-produce the monitoring standards by which they are held accountable, principal oversight capacity is itself endogenous to agent behaviour. This review draws on this body of work to inform how PA theory, appropriately extended and critically qualified, can guide the design and evaluation of climate finance instruments across mitigation, adaptation, and systemic financial risk.

Scope And Approach

The PA framework applied here integrates three distinct bodies of literature: foundational and applied PA theory from economics and political science; empirical scholarship on climate finance instruments including the CDM, REDD+, and payments for environmental services; and program documentation from the World Bank's ISFL and related results-based initiatives. The aim is conceptual integration rather than statistical aggregation.

The review draws on literature assembled through searches of Google Scholar, JSTOR, and publisher databases. Theoretical foundations were identified using terms including "principal–agent theory," "moral hazard," "adverse selection," "multitask problems," and "delegation in international organisations," with priority given to canonical contributions — Ross (1973), Jensen and Meckling (1976), Holmström (1979), Holmström and Milgrom (1991), Laffont and Tirole (1993) — alongside political science applications to international organisations and development finance. Empirical literature was collected from peer-reviewed articles, edited volumes, and policy reports using terms including "Clean Development Mechanism," "REDD+," "payments for environmental services," "results-based climate finance," and "additionality." Four recent contributions — Helm and Wirl (2014), Houskeeper (2025), Hotte et al. (2016), and Ben Jelili (2025) — were integrated separately, each addressing a dimension of the climate finance problem that standard PA formulations cannot accommodate. For ISFL-specific evidence, I drew on publicly available World Bank documentation including annual reports from 2016 to 2024, the Results-Based Climate Finance in Practice report (2017), the Nesting Paper (2018), the Buffer Requirements document (2023), and the Pause and Reflect Summary Report (2024), selected for their longitudinal coverage of a single program across its full operational history. A narrative rather than systematic review approach was adopted because the literature spans economics, political science, environmental policy,

and development studies, with terminologies that do not map cleanly onto one another, and because building an integrated theoretical argument requires interpretive judgment rather than exhaustive enumeration.

Several limitations apply. The review draws primarily on English-language sources, risking underrepresentation of scholarship from ISFL host countries. It relies on secondary program documentation rather than original fieldwork, and the World Bank's own reports — while relatively candid — are produced by the institution being analysed. The review also does not systematically engage with alternative theoretical lenses such as political ecology, post-colonial critiques of climate finance, or feminist institutionalism, each of which would illuminate dimensions of the ISFL experience that PA analysis cannot easily reach.

DISCUSSION

Climate finance fails not because of poor program design or bad faith on the part of recipients, but because the delegation relationships it necessarily creates generate adverse selection, moral hazard, multitask trade-offs, and contract incompleteness as predictable structural features. Donors with global interests contract with agents with local ones; institutions operating on political cycles must govern forests that change over decades; and the counterfactual against which results must be measured can never be directly observed. Understanding ISFL requires taking these structural conditions seriously rather than treating them as implementation problems that better procedures can resolve.

What makes climate finance theoretically distinctive is not only the length of the delegation chain but the nature of the externality being financed. Helm and Wirl (2014) show that when both principal and agent are affected by aggregate emissions, the contracting problem differs fundamentally from standard PA models: the principal's own behaviour — including the credibility of its emission reduction commitments — becomes part of the incentive system rather than merely its backdrop. Houskeeper (2025) sharpens this further by identifying a second-order failure that persists even after first-order problems of waste and implementation are resolved. The financed action must replace a more polluting counterfactual to generate genuine mitigation, but that counterfactual is unobserved and unverifiable. This is an identification problem that methodological refinement — including the sophisticated reference levels ISFL has developed — cannot fully resolve. It sets a ceiling on additionality confidence that more rigorous accounting cannot raise.

What ISFL Has Achieved

Against this backdrop, ISFL's design features represent genuine institutional progress. ERPAs condition payment on independently verified emission reductions, directly addressing the moral hazard that grant-based programming creates: by tying disbursement to output rather than effort, the ERPA structure removes the principal's exposure to agents who secure resources without delivering results. Colombia's 2021 ERPA and Zambia's 2023 commitment covering up to 17 million tons of CO_2 equivalent represent the program's shift from input-based to output-based accountability made operational.

Jurisdictional MRV systems address the information asymmetry problem at the program's core. Ethiopia's national forest monitoring system, Mexico's reference level development, and Zambia's forestry and livestock baselines progressively close the observational gap between the World Bank and national governments. Crucially, they also alter agent behaviour prospectively: when agents know their performance is rigorously tracked, the scope for both adverse selection at program entry and moral hazard during implementation narrows. The 2023 buffer requirements — requiring programs to reserve a share of verified reductions as insurance against reversals — extend this logic to contract incompleteness. Ex ante contracts cannot specify all contingencies, and buffer mechanisms institutionalise the recognition that durable climate governance requires adaptive capacity rather than static contract design.

Benefit-Sharing Plans address a subtler problem in the delegation chain. Without transparent distribution rules, national governments may capture a disproportionate share of ERPA revenues, undermining the incentives of subnational actors — communities, local governments, smallholders — whose behavioural change the program actually depends on. By making benefit distribution a contractual obligation, BSPs partially address the multitask problem: carbon accounting, community engagement, gender inclusion, and biodiversity protection cannot all

be rewarded if only the most measurable objective carries contractual weight. The jurisdictional scale of ISFL addresses leakage through a related logic — by encompassing entire provinces or regions, it makes displacement of deforestation outside program boundaries structurally harder, closing a loophole that project-based mechanisms like the CDM left systematically open.

What Persists

These advances are real, but the theoretical literature predicts — and ISFL's documentation confirms — that results-based design restructures agency problems rather than eliminating them.

The readiness phase illustrates adverse selection operating at the international level. Countries self-select into ISFL participation partly because the financial and reputational benefits are attractive, but institutional capacity to deliver results develops more slowly than contractual commitment implies. Governments signal readiness on the basis of private information about their own capabilities that the World Bank cannot fully verify at the screening stage. The result is a systematic gap between stated readiness and actual implementation capacity — not a failure of individual programs but a structural feature of voluntary participation in complex, capability intensive contracts.

Moral hazard is embedded in the transition from readiness to performance. Grant-funded activities do not carry the same incentive discipline as performance-based payments, and the longer the period between initial engagement and ERPA disbursement, the more sustained the effort that must be maintained without strong incentive support. Where governments were already pursuing land-use reforms for domestic political or economic reasons, ISFL participation may represent Houskeeper's transfer scenario rather than the mitigation scenario: the program compensates rather than induces, without the accounting systems being capable of distinguishing reliably between the two.

Multitask substitution is structurally embedded in ISFL's objectives. Carbon reductions are more readily quantified than gender equity, biodiversity conservation, or subnational political buy-in, and the incentive system therefore creates pressure toward carbon metrics even when the program's stated goals are broader. The tensions documented between livestock productivity and emissions baselines in Ethiopia and Zambia, and between carbon accounting and gender equity goals across jurisdictions, are not calibration failures — they are the predictable consequences of rewarding a measurable objective in a multi-objective environment. BSPs and safeguard requirements represent the program's attempt to make non-carbon objectives contractually binding, though the enforceability of those obligations when they conflict with verified emissions targets remains an open institutional question.

Contract incompleteness is perhaps the most fundamental persistent challenge. The 2023 introduction of buffer requirements — a decade into the program — illustrates that initial ERPA terms could not anticipate the full distribution of reversal risks. The unresolved difficulties with project nesting documented in the 2018 Nesting Paper reflect a related problem: the integration of subnational activities into jurisdictional accounting creates contractual contingencies that neither party could fully specify in advance. Climate finance contracts will always be incomplete in this way, and the governance implication is that mechanisms for renegotiation and adjustment are as important as initial contract design.

Implications for Climate Finance Design

The ISFL record generates several theoretical and practical conclusions.

Results-based finance is a necessary advance over input-based programming but not a solution in itself. It reduces moral hazard by tightening the link between payment and performance, but it cannot resolve the counterfactual identification problem that additionality claims require, and performance metrics that incompletely capture a program's objectives will systematically produce effort substitution. The appropriate inference is not that results-based design should be abandoned but that it needs to be understood as one element of a broader institutional package.

The timing structure of incentives matters more than climate finance design has typically recognised. A decadelong lag between program launch and ERPA disbursement selects, in effect, for institutional endurance rather than climate ambition. Countries with high private discount rates — where the opportunity cost of long readiness phases is greatest — are systematically disadvantaged in jurisdictional programs structured this way. Shortening or better supporting the readiness-to-performance transition is not only an administrative preference but a selection problem with equity implications.

Jurisdictional scale helps manage leakage but does not dissolve the contracting problem — it rescales it. When the agent controls an entire jurisdiction, the stakes attached to baseline-setting increase, the counterfactual becomes harder to establish, and political economy conditions within the jurisdiction shape outcomes in ways that contract terms cannot fully anticipate or control.

Risk-sharing deserves institutional attention equal to payment design. The distributional question of who bears the cost when programs underperform — from reversal events, from political transitions, from commodity price shocks that alter land-use incentives — is underspecified in most ISFL jurisdictions. Buffer requirements address the environmental integrity dimension of this problem, but the financial and institutional exposure of subnational actors and communities when programs miss targets remains largely unresolved. Explicit risk-sharing arrangements, designed in advance rather than negotiated post hoc, may be among the most important institutional innovations available.

Finally, the adaptive capacity ISFL has demonstrated over a decade — the iterative development of buffer mechanisms, nesting frameworks, and benefit-sharing provisions — is itself a governance achievement that standard PA analysis tends to underappreciate. The challenge going forward is to institutionalise that capacity rather than leaving it contingent on the particular personnel, donor configurations, and political conditions that have sustained it to this point. Climate finance instruments that cannot adapt are not merely inefficient; they are increasingly mismatched with the risk environment they are designed to govern.

CONCLUSION

This review set out to examine how principal–agent theory explains the performance of results-based climate finance, using ISFL as its primary empirical case. The answer is neither that PA theory fully accounts for what goes wrong nor that institutional design is powerless to improve outcomes. It is more specific than either of those positions, and more useful.

The central finding is that agency problems in climate finance are structural. They arise not from implementation failures or bad faith but from the delegation relationships that climate finance necessarily creates — between donors with global interests and agents with local ones, between contracts written today and forests that change over decades, between verification systems and counterfactuals that cannot be observed. ISFL's persistent challenges with readiness delays, effort substitution, and contract incompleteness are not deviations from a well-functioning system. They are the predicted consequences of delegation under asymmetric information and divergent time horizons, operating in a domain where the good being produced is a global public benefit whose counterfactual is structurally unverifiable.

The second finding is that results-based design represents genuine institutional progress without constituting a solution. ERPAs, jurisdictional MRV systems, buffer mechanisms, and benefit-sharing plans each address specific agency problems identified in the theoretical literature, and the longitudinal ISFL record shows that these features have meaningfully constrained moral hazard and narrowed information asymmetries relative to project-level predecessors. But results-based payment cannot close the counterfactual identification problem that sits at the heart of additionality claims. It cannot fully align the time horizons of donors and recipients. And it cannot by itself correct the inequitable distribution of costs and risks that makes voluntary climate action individually irrational for many agents even when it is collectively desirable.

The third finding concerns what the broader institutional package requires. The most durable innovations in ISFL — buffer requirements developed in response to accumulated experience, nesting frameworks revised over time, benefit-sharing provisions made progressively more binding — reflect adaptive governance rather than static

contract design. The field has invested heavily in payment architecture and verification methodology, and rather less in the risk-sharing arrangements, subnational institutional development, and adaptive governance frameworks that determine whether incentive structures produce durable behavioural change or merely durable paperwork. Rebalancing that investment is among the clearest practical implications of a PA analysis of climate finance at scale.

PA theory earns its place as the organising framework for this analysis, but its limits are as instructive as its insights. It identifies delegation failures and accountability gaps with precision, but it cannot explain why some governance contexts sustain the credible commitment and institutional endurance that jurisdictional climate finance requires while others cannot. That question leads toward the political economy of state capacity, the distributional politics of land tenure, and the domestic institutional conditions that shape whether an agent government can actually deliver what an ERPA requires. Contract design and governance conditions are both necessary. A decade of ISFL experience makes clear that neither is sufficient on its own.

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