

A Study on the Internal Logic, Major Practices, and Long-Term Mechanisms of Green Finance Development

Yubo Zhang

*Beijing Foreign Studies University, Beijing, China
202420102130@bfsu.edu.cn*

Abstract. Climate change keeps piling on pressure, and resources are getting tighter. Green finance has moved to the front line as the main lever for pushing the world economy onto a low-carbon, sustainable track. Its day-to-day work now covers policy, regulation, new products, reward schemes, standard setting, and cross-border teamwork. Governments draw up national plans and laws; markets roll out green bonds, sustainability-linked loans, and carbon markets. The idea is simple: turn outside environmental costs into inside costs, back national green goals, and stay in step with global talks. Money then flows where it should, risks get cushioned, and signals nudge industry to clean up its act. Still, standards stay patchy, incentives feel thin, most products look alike, and greenwashing lurks. A lasting setup needs four things moving at once. First, firmer rules and clearer disclosure. Second, bigger and livelier markets, with tax breaks that actually work. Third, tech-driven ideas that reach beyond copy-paste deals. Fourth, closer alignment on global norms. If these gears mesh, green finance can shift from chasing sheer size to delivering real quality, keeping the money tap open for an economy-wide green switch.

Keywords: green finance, internal logic, long-term mechanism

1. Introduction

Global climate change keeps piling on pressure, and resource-environment limits are tightening. Green finance has moved from the sidelines to center stage; it now powers the worldwide green transition [1]. Three layers push this shift: international deals, national policies, and sector-level moves [2].

Countries now feel the heat from abroad. The Paris Agreement turned the low-carbon shift into a shared global goal [2]. Storms and sudden policy jumps hurt balance sheets, so governments fold green finance into their own plans to keep the system steady [3].

Back home, ecological civilization keeps moving forward. China's "dual carbon" targets—carbon peaking and carbon neutrality—have kicked in, giving the push a life of its own [1]. Hitting those goals will need tens to hundreds of trillions of yuan, and that price tag dwarfs what the treasury can spare [4]. So the financial system has to shift large amounts of social capital, pulling money out of old high-carbon lanes and into new green ones [5].

China's green finance has ballooned, yet the industry now runs into stubborn structural walls. Standards still sit in separate silos, incentive-and-penalty mechanisms remain weak, and product

innovation appears only in scattered pockets [4]. Rich coasts grab the spotlight while inland zones lag, which together blocks the shift from counting size to pursuing quality. We therefore need to map the inner logic of green finance, summarize what works in practice, and sketch long-term mechanisms that can endure [6]. Review studies likewise summarize the dilemmas and development path of China's green finance development, reinforcing the need for a mechanism-oriented analysis [7].

This study tackles four big questions: what models, features, and outcomes appear in domestic and international green finance practice; what internal logic keeps green finance moving; what structural factors constrain China's high-quality green finance development; and how a systematic long-term mechanism can be built. Domestic bibliometric reviews provide a useful overview of the existing research landscape of green finance [8]. On the theoretical side, the paper responds to a literature tendency that emphasizes practice but often lacks conceptual clarification, and it builds an analytical framework for the coordinated evolution of green finance [9]. On the practical side, the study aims to provide policy support for refining China's dual-carbon strategy and to offer guidance for financial institutions in product design and environmental risk management [10].

2. Major practices in the development of green finance

Global progress in green finance is not the product of any single lever but of coordinated top-level planning, market innovation, targeted incentives, standards building, and focused support [1]. These practices together form the real-world pathway by which green finance moved from concept to scale [3].

2.1. Policy and top-level institutional design

A sound legal and institutional foundation, together with clear strategic planning, underpins orderly market development [11]. Major economies have elevated green finance to national strategy, creating stable long-term expectations [3].

At the strategic level, documents such as the EU's Action Plan on Financing Sustainable Growth, the UK's Green Finance Strategy, and Japan's Green Growth Strategy set out national visions, key elements, and priority sectors, constituting comprehensive policy toolkits [11].

At the legal and regulatory level, legislation is increasingly used to lock in commitments and clarify responsibilities [11]. The EU Sustainable Finance Taxonomy supplies technical screening criteria that mitigate greenwashing risk; the UK's Climate Change Act and Germany's Federal Climate Protection Act codify carbon neutrality targets and strengthen legal enforceability; and the U.S. Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) institutionalizes the polluter-pays principle [3]. International standards such as the ICMA Green Bond Principles and the Climate Bonds Initiative's Climate Bonds Standard provide a common language for cross-border green capital flows, lowering transaction costs and building market trust [6].

2.2. Product innovation and market development

Market depth and breadth depend on ongoing product and service innovation [3]. International markets have moved from a reliance on green credit to a diversified ecosystem spanning debt, equity, and derivatives [12].

Green bonds led the market's expansion, channeling proceeds into renewable energy, clean transport, and other priority sectors [3]. Sustainability-linked loans (SLLs) have gained rapid traction because they link financing costs to predefined sustainability performance targets (SPTs), such as emissions reductions or water-use efficiency, thereby aligning incentives and motivating corporate green transformation [12]. Carbon finance markets, anchored by mechanisms such as the EU Emissions Trading System, have matured into infrastructures that send price signals to guide emissions reductions, while carbon futures and options enhance liquidity and risk management [3].

2.3. Policy incentives and coordination of financial instruments

Governments first dangle carrots by offering tax breaks, concessional loans, and direct subsidies to stimulate green investment [2]. Public agencies also coordinate green bonds, subsidy funds, and bank credit so that projects do not stall because of funding gaps [3]. In addition, governments use guarantees, performance assessments, and local retail green instruments to mobilize institutional and household capital toward green projects [3]. Compared with short-term price signals, stable policy signals are often more effective because they can shape expectations over a much longer horizon [2].

Green projects often generate broad positive externalities, yet they usually require high upfront investment and long payback periods [2]. Because of that, public incentives and coordinated policy instruments remain crucial [5].

Governments lean on fiscal tools such as tax credits, direct subsidies, and dedicated funds to lower project costs and reduce risk [3]. U.S. renewable funds and Australia's Low Emissions Investment Fund are typical examples [3].

Central banks and supervisors are now testing green tools by purchasing green assets, accepting them as collateral, and offering cheaper refinancing [3]. The goal is to cut financing costs and nudge banks toward greener portfolios [3]. Public capital also steps in to crowd in private investment, as illustrated by the UK Green Investment Bank and Europe's recovery funds [3].

2.4. Standards and international cooperation

Countries once wrote their own rulebooks, but fragmented standards increased transaction costs and coordination problems [11]. Through repeated negotiation, standard-setting gradually produced common technical rules and improved cross-border compatibility [6]. In this sense, standards and international cooperation work together to keep transnational economic and technological systems operating more smoothly [11].

Green finance crosses borders by nature, so countries need shared rules to track capital flows and environmental impacts [11]. Governments and financial institutions therefore work together to establish common benchmarks that can better manage cross-border environmental risks [6].

Standard convergence makes international cooperation easier, and the EU taxonomy has gained broad global influence [11]. The EU–China Common Ground Taxonomy is an important step toward mutual recognition, while climate-related disclosure frameworks such as TCFD help investors identify risks and opportunities [11]. Environmental risk assessment (ERA) tools further translate complex environmental exposures into analyzable and manageable indicators [6].

Multilateral platforms act like bridges by enabling countries to exchange experience and coordinate policies [2]. The G20 Green Finance Study Group pushed green finance onto the international agenda, while the Network for Greening the Financial System (NGFS) and the Green Investment Principles for the Belt and Road (GIP) created additional channels for regulatory communication and green investment coordination [11].

2.5. Targeted support and transition finance practice

Targeted support focuses on bottlenecks in the green transition and uses loans, guarantees, and other tailored tools to ease financing constraints [13]. Financial support can also be adjusted during implementation to respond to technical and infrastructure constraints, thereby reducing transition risks [4]. When such arrangements work well, they can quickly improve emission-reduction performance and strengthen investor confidence [13].

The transition keeps deepening. Financial support no longer sticks to pure green projects but increasingly covers transition activities inside high-carbon industries [12]. This shift helps balance industrial continuity and social equity [4].

Money is flowing faster toward priority sectors and regions that have long been left behind, and transition support is being directed to old industrial areas [4]. The EU's Just Transition-related funds and Japan's sector-specific transition finance roadmaps both illustrate how policy guidance can steer capital toward low-carbon upgrading in hard-to-abate industries [3].

Transition finance steps in where traditional green finance leaves off by recognizing that decarbonization often happens gradually [12]. Sustainability-linked loans, for example, do not limit funds to green projects alone but tie financing conditions to measurable emissions reductions, thereby widening the scope of supported economic activity [12].

3. The internal logic of green finance development

Green finance did not emerge by accident. It arose from the growing need to respond to environmental pressure and to redirect capital toward cleaner sectors [9]. As governments introduced incentives and financial institutions adjusted risk pricing, green investment became both more commercially attractive and more systematically embedded in financial decision-making [1].

Green finance did not just appear suddenly; it developed under the combined influence of environmental pressure, policy guidance, and institutional evolution [9]. These drivers are connected to specific operational mechanisms and regulatory arrangements, which together explain why green finance exists, how it works, and why it can remain sustainable [10].

3.1. Fundamental driving forces

Green finance has one main motive: to support the shift to a green, low-carbon economy [9]. National policies and international governance frameworks steer and accelerate that process [10].

First, the whole idea rests on correcting market failures and reshaping value allocation [9]. Green finance internalizes environmental externalities into prices and redirects capital toward projects with ecological value [10]. Once ecological assets can be measured, collateralized, and traded, they can be transformed into financial instruments and recognized as economic value [9].

Second, national strategies and policy frameworks act as the main magnet. China's government-led model shows how top-level design, from broad concepts to the five-pillar framework, turns green finance into a strategic tool for ecological civilization and the dual-carbon goals [1]. Policy signals also push financial institutions to innovate and encourage firms to transform, forming a chain in which policy influences markets and markets then influence firms [5].

Third, a broad global governance consensus keeps pushing things forward by framing green finance as a form of global public good [11]. Because climate change crosses borders, countries coordinate rules and attract international capital through cooperation, which reinforces the legitimacy of green finance [2].

3.2. Practical operational pathways

We start by clarifying objectives and selecting practical implementation steps, so that green finance tools can be matched with concrete development tasks [14]. Cost calculations, process simplification, and operational guidelines are all part of turning broad policy goals into workable financial service arrangements [13].

Green finance follows this guiding logic and takes shape in concrete application scenarios [10]. Each practice remains tied to a specific sector and development objective, so that capital allocation and policy goals stay aligned [14].

First, green finance supports new productive forces and stronger supply-chain resilience by reallocating capital toward cleaner technologies and providing risk protection during transition [10]. Empirical evidence from heavily polluting industries further indicates that green finance reform policies can promote enterprises' incremental high-quality development [15]. These functions not only promote green technological progress but also improve the resilience of industrial chains to environmental and transition shocks [14].

Second, green finance supports rural revitalization and agricultural modernization by promoting green farming technologies and greater integration across agricultural value chains [14]. Because regional conditions differ and rural ecological assets are difficult to price, local service models still need to be tailored to specific contexts [13].

Third, turning ecological product value into financial value depends on accurate matching between asset characteristics and financial instruments [13]. Ownership structure, investment horizon, and risk profile all need to be assessed before designing suitable financial products and services [13].

3.3. Institutional guarantees for sustainable development

Institutional guarantees for sustainable development are built through rule-making, supervision, and periodic adjustment [16]. In practice, systems such as registries, verification mechanisms, and loss-sharing arrangements help reduce uncertainty and make green finance more workable [13]. Continuous review and revision are equally important because long-term sustainability depends on institutions that can respond to changing market conditions [16].

Keeping things going for the long haul means continuously adjusting the system and monitoring risks [16]. Green finance therefore needs an institutional setup that can adapt when conditions change and still maintain sustainability [13].

One key safeguard is the continued improvement of standards and disclosure systems, because standards provide the common language of green finance [6]. A clear, comparable, and verifiable disclosure framework, such as TCFD, is also essential for market trust because it reduces greenwashing risks and lowers transaction costs [11].

Another safeguard is to monitor systemic risk closely and ensure policy coordination across monetary, fiscal, industrial, and environmental domains [16]. Green finance involves transition risks, including the repricing of high-carbon assets and regional or sectoral instability during decarbonization [16]. Stable and coordinated policy expectations are therefore necessary to prevent uncertainty from discouraging green innovation [17].

To sum up, green finance operates as an integrated system whose core mission is to support the green transition [9]. Policy guidance and global governance provide the initial impetus, while practical applications extend support into specific sectors and regions [13]. Over time, stronger

standards, better disclosure, improved risk control, and continued policy coordination make this system more self-reinforcing [16].

4. Practical constraints and potential risks in green finance development

Green finance still bumps into real-world walls. In practice, incomplete carbon data and uneven statistical quality constrain accurate measurement and investment decisions [18]. Mismatches between loan maturities and project payback periods, together with uncertainty in climate-risk pricing, further constrain long-term green investment [4]. At the same time, frequent policy adjustment, greenwashing concerns, data-quality problems, exchange-rate volatility, and sudden subsidy changes can all amplify financial risk during the transition [16].

Despite rapid expansion, green finance faces interlinked obstacles across institutional, market, and systemic risk dimensions that constrain healthy development [16].

4.1. Weak institutional foundations

A unified institutional framework is crucial but currently incomplete [5]. One chief problem is the lack of a consistent and operational standards system, especially at the micro-implementation level [6]. Significant discrepancies between domestic standards and international norms, particularly in classifying fossil-fuel-related projects, raise transaction costs for cross-border capital flows and create compliance barriers for domestic institutions [11].

Moreover, uneven and delayed policy supply at the local level has created policy gaps, because green finance relies heavily on local governments' supporting policies and regulatory capacity [13]. Where local policy issuance is slow or weak, regional disparities intensify and a cohesive national green finance market becomes harder to form [4].

4.2. Market malfunctions

Market shortcomings weaken endogenous incentives because many green projects involve high upfront capital requirements, long payback periods, and modest short-term returns [4]. Although green loan portfolios often show relatively good asset quality, institutions still evaluated by traditional profit indicators may hesitate to shift resources away from short-term high-yield investments, creating tension between social responsibility and commercial objectives [10].

Market failures are pronounced in carbon trading. China's carbon market is large but remains dominated by spot trading, while derivatives such as carbon futures and options are still underdeveloped [4]. As a result, carbon prices provide weak long-term signals for emissions-reduction investment and limit market allocative effectiveness [16].

Product and service offerings are structurally imbalanced. Supply remains highly homogeneous and is concentrated in large corporate lending and interbank bond markets [14]. Retail products for SMEs and households are still scarce, and capital tends to cluster in a few popular industries, leaving many sectors underserved in the broader green transition [4].

4.3. Derived systemic risks

If these issues are left unresolved, they can snowball into systemic risks [16]. Such risks may damage market integrity and, in turn, threaten broader financial stability [16].

Greenwashing is the most immediate credibility issue, because green capital may be directed to projects that are not genuinely green [17]. Lax or even fraudulent certification can further undermine

investor confidence and expose financial institutions to reputational and legal risks [17].

One major concern is cross-market contagion. In some Western markets, green derivatives have become increasingly speculative and have drifted away from the real economy, increasing instability [16]. In China, environmental-rights markets are still developing, and risks may spread through links among local government debt, corporate guarantees, and overlapping banking exposures [16].

Institutional standards remain unstable, policy signals are fragmented, and the overall foundation of the market is therefore weakened [6]. Distorted incentives can suppress innovation, while misleading green labels may evolve into greenwashing [17]. If these problems are not addressed, the long-term mechanism of green finance will struggle to function effectively [16].

5. Mechanism construction for the long-term development of green finance

We need a clear plan that keeps green finance moving for years. Banks and funds should first clarify what counts as "green" and establish operational screening rules [13]. Regulators also need to maintain open and transparent information disclosure so that markets can improve capital allocation through continuous feedback [5].

Green finance has to shift from policy push to a model that can grow on its own and remain stable over time [9]. Building such a long-term mechanism requires the coordinated development of institutions, markets, innovation, and international cooperation [13].

First, a solid policy and legal framework is the bedrock. Mandatory environmental information disclosure and green-transition indicators in government assessment can strengthen accountability and improve implementation [5]. Policy-oriented green banks, risk compensation funds, interest subsidies, and earmarked tax revenues can further reduce financing costs and support a polluter-pays reinvestment cycle [13].

Second, the market system needs to become both more dynamic and more diversified. In addition to major banks, smaller financial institutions, brokers, insurers, and specialized intermediaries should be encouraged to participate more actively in green finance [1]. A unified national green project database, corporate carbon accounts, and stronger talent development can further reduce information asymmetry and improve pricing and risk management [5].

Third, fintech-driven innovation can improve both green financial products and service efficiency [14]. Instruments linked to environmental rights, sustainability-linked financing, environmental liability insurance, data-driven risk models, blockchain-based carbon-asset management, and digital ESG platforms all expand the range and quality of green financial services [14].

Finally, international cooperation needs to be deepened so that domestic green finance can connect more effectively with global capital markets [11]. Aligning domestic rules with international standards, promoting mutual recognition, experimenting with offshore green bonds and cross-border asset transfer arrangements, and relying on multilateral platforms such as the Green Investment Principles for the Belt and Road can all strengthen international influence and attract more cross-border capital [11].

In short, a long-term mechanism rests on four mutually reinforcing pillars: institutions, markets, innovation, and global coordination [9]. Advancing these four dimensions together can create stable policy expectations, more active markets, more efficient services, and stronger interaction between domestic demand and international capital [13].

6. Conclusion

We took a close look at how green finance actually works, what people are doing with it, and the rules that keep it moving over time. Green finance started climbing because everyone suddenly felt the heat of climate change and needed a smoother road to a greener economy. The idea is simple: make pollution cost something. Add the country's dual carbon targets—those pull investors in. Then there's the global chorus pushing the same tune; that shoves the money too. Around the world you now see governments drawing big road maps, banks rolling out fresh products, and regulators handing out layered perks. They line up standards, toss in transition finance, and keep stretching the menu. All of it steers cash toward cleaner projects. Resources get pointed the right way, risks get cushioned, and the signal flashes green.

Progress is hitting a wall. Disparate standards trip everyone up. Market incentives stay weak. Products look the same. Greenwashing keeps the spotlight on scale, not quality. We need a long-term mechanism. It should rest on institutional safeguards, market cultivation, innovation, and international coordination. First, tighten the legal frame and force clearer disclosure. Next, tweak fiscal and tax perks so they actually reward the good stuff. Bring in diverse players and sharp intermediaries; they keep the game lively. Build environmental-rights financial instruments. Run them with fintech tools that feel actually practical. Finally, line domestic rules up with global ones. That pulls local money into the wider green capital flows.

Looking ahead, researchers and practitioners need to do a few things. First, they should deepen mutual recognition of domestic and international standards. That move will lower cross-border transaction costs. Another thing worth mentioning: build transition finance frameworks. These frameworks back just transitions for high-carbon industries. Teams also need to strengthen fintech applications. These applications can quantify risk, track carbon, and fight greenwashing. They should also explore integration with biodiversity finance and other emerging areas. On top of that, regulators must boost their capabilities to identify, warn against, and contain systemic financial risks during the transition. Sustained conceptual work and practical innovation will allow green finance to play an even firmer role in supporting comprehensive green transformation at home and abroad.

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