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RESEARCH ARTICLE

Investing In Green Loans as a Mechanism for financing Environmentally friendly investment projects: Analytical Study (2020-2025)

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Abstract

This study aims to highlight the role of green loans as a mechanism for financing environmental projects and sustainable investments. It focuses on the conceptual framework of green loans, green finance, and sustainable banking, given their importance in achieving the environmental dimension of sustainable development. The study also includes an analytical examination of the environmental impact of green loans through reducing greenhouse gas emissions and promoting the use of clean energy, thereby supporting the transition to a low-carbon economy.

This study employs a descriptive-analytical approach, analyzing the development of green loans during the period 2020-2025 in terms of volume, the trends in beneficiary sectors, and geographical distribution. The study concludes that green loans represent an effective financing mechanism for directing resources towards strategic environmental projects. They contribute to integrating economic and environmental dimensions and enhance the ability of economies to transition towards sustainable development models, provided that rigorous regulatory frameworks and effective oversight mechanisms are in place to ensure transparency and accountability.

Citation

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I.Introduction:

Environmental challenges related to climate change and the depletion of natural resources have become among the most prominent global issues facing modern economies, compelling governments and financial institutions to seek innovative financing models that support the transition to sustainable development. In this context, green finance has emerged as a strategic tool aimed at directing investments towards environmentally friendly projects that contribute to reducing carbon emissions and enhancing the efficiency of natural resource use.

Green loans are among the most important mechanisms of sustainable financing, having witnessed remarkable expansion in recent years. They represent a financial instrument specifically designed to finance projects with a

positive environmental impact, such as renewable energy projects, waste management, energy efficiency, and sustainable infrastructure. These loans are characterized by their direct link to clear environmental standards and monitoring and evaluation mechanisms designed to ensure that funds are used in activities that achieve sustainability goals.

Despite the rapid growth of the green loan market internationally, the conceptual and regulatory framework for this type of financing remains a subject of academic debate, particularly regarding its effectiveness in balancing economic returns and environmental impact, in addition to the challenges associated with measuring environmental performance and the risks of greenwashing. A research gap also exists concerning the extent to which green loans can stimulate private investment and contribute to the long-term transition to a green economy.

Accordingly, this study aims to analyze the role of green lending as a financing mechanism for environmentally friendly projects. It will review the theoretical and conceptual framework of this type of financing, analyze its economic and environmental impacts, and highlight the challenges facing its expansion in financial markets. The study seeks to provide an analytical perspective, supported by recent literature, that contributes to enriching the academic debate on sustainable finance and provides a scientific basis for policymakers and financial institutions to develop more effective green finance policies.

Research Problem:

- **What is the role of investment in green loans in contributing to the achievement of the environmental dimention of sustainable development projects?**

Research Significance:

The importance of this study lies in the following:

- The novelty of the topic of green loans, especially as the world is currently witnessing a signification expansion in sustainable finance;
- The trend among most countries towards adopting innovative financing that supports the transition to sustainable development;
- Highlighting the importance of adopting green finance as a strategic tool aimed at directing investments towards environmentally friendly projects.

Research Objectives:

This study also aims to:

- Identify the theoretical framework of green finance, green banking service, and green loans;
- Identify the relationship between green loans and the environmental dimension of sustainable development;
- Analyze the development of green loans during the period 2020-2025 in terms of volume, trends in the beneficiary sectors, and geographical distribution.

II.The theoretical and conceptual framework of green finance and green Banking

This framework highlights that green loans represent a strategic financing tool within the sustainable finance system, due to the regulatory mechanisms and international standards they provide to ensure that financial resources are directed towards projects that achieve economic and environmental value simultaneously, thus promoting the transition towards a green economy and reducing long-term environmental risks.

1- Green finance :

In an era where environmental concerns are at the forefront of global discussions, the concept of green finance has gained considerable attention. This financial approach seeks to align economic activities with sustainable and environmentally friendly practices (Chehaimi, 2024).

The term green finance appears in many studies. However, there is no universal definition of green finance:

- Green finance is defined as financial products and services, under the consideration of environmental factors throughout the lending decision-making, ex-post monitoring and risk management processes, provided to promote

environmentally responsible investments and stimulate low-carbon technologies, projects, industries and businesses (Nannette Lindenberg, 2014, p. 01).

- Green finance is a phenomenon that combines the world of finance and business with environmentally friendly behavior. Green finance is an arena for many participants, including individual and business consumers, producers, investors and financial lenders (Fu, 2020, p. 143).
- Green finance aims to direct capital towards projects and initiatives that have positive environmental impacts. Whether it's renewable energy, reforestation, or waste management, the goal is to create a greener and more resilient planet (Chehaimi, 2024).

2- **Green Banking Practices:**

Within environmentally responsible banking, green banking has increased in popularity over the last several decades. According to Hasib and Basher, green banking is a subsection of banking that attempts to promote sustainable development while considering all social and environmental concerns. Green banking boosts a bank's credibility by proving it cares about the environment and encouraging its customers to do the same.

Green banking decreases monetary outflows and boosts national income via resource conservation and cost avoidance. In addition to strengthening the bank's credibility by showing that it cares about environmental issues, green banking also has other benefits, such as reducing expenses by cutting back on paper, electricity, and water use; boosting efficiency and productivity in the workplace through the innovative application of technology; and reducing dangers through the use of safer, more sustainable practices.

Environmental education and training aim to provide employees with the information, perspective, and abilities needed to satisfy the environmental management standards established by higher management. Operation-related green practices explain how banks are able to reduce the hostile environmental effects of their daily operations, including the quantity of paper they use, the energy they utilize, and the emissions they emit, as a direct result of green banking policies being put into place. To enhance their environmental performance, financial institutions have integrated more environmentally conscious practices into their day-to-day operations. (Tabassum , Al Karim, Rabiul, Ul Alam, & Dewan Niamul, 2025)

3- **Green Loans between importance and general standards**:

Green loans can help finance the transition to a low-carbon economy, However, developing countries currently hold only $1.6 billion of the approximately $33 billion in outstanding green loans. Because climate is a strategic pillar of the International Finance Corporation's (IFC) work, it is committed to increasing its investments related to addressing climate change, including its investments in green loans (world bank group, 2021).

The World Bank Group's International Finance Corporation (IFC) is the largest development finance institution supporting the private sector in emerging markets and the leading provider of green loans among international development banks.

3-1 The Concept of Green Loans:

Green loans have emerged as a versatile and accessible financing option for organizations looking to fund eco-friendly projects. These loans are typically structured to incentivize environmentally responsible practices and initiatives (Arbor.eco, 2025).

- A green loan is a form of financing that enables borrowers to use the proceeds to exclusively fund projects that make a substantial contribution to an environmental objective.
- A green loan is a form of financing that mobilizes capital for green projects.

A green loan is similar to a green bond in that it raises capital for eligible green projects. However, a green loan is based on a loan that is usually smaller than a bond and is executed through a private process. Green bonds typically have a larger size, may have higher transaction costs, and can be listed on a stock exchange or issued privately.

Green loans and green bonds also follow different but consistent principles: the International Capital Market Association's (ICMA) Green Loan Principles and Green Bond Principles (GBP) stipulate that both instruments must use 100% of the proceeds exclusively for qualifying green activities (world bank group, 2021).

3-2 The Importance of Green Loans:

Green loans are earmarked specifically for environmentally beneficial projects. Whether it's funding renewable energy installations, supporting energy-efficient building retrofits, or promoting carbon-reduced agricultural practices, green loans ensure that borrowed funds are exclusively directed towards green endeavors (Arbor.eco, 2025). Developing countries currently account for just only $1.6 billion of the $33 billion in outstanding green loans, but the market is growing rapidly, outpacing the growth of the green bond market in the near term. The importance of green loans lies in the following:

- Green loans help align lending with environmental goals;
- Green loans help borrowers integrate greening into their operations and supply chain;
- Considering the higher transaction costs of issuing bonds issuance, the minimum bond size that can be traded, and the fact that only bonds above a certain size are tracked by various indices, potential issuers in emerging markets with small green portfolios may be inclined to obtain a green loan rather than issue a green bond (world bank group, 2021).

3-3 Principles and Standards for Green Loans:

To be called a green loan, a loan should be structured in alignment with the Green Loan Principles, which provide an international standard based on the following four core components (Bao , Benbouzid, Sushanta, & Stojanovic, 2026):

A. **Use of Proceeds:** Designated green projects must provide clear environmental benefits, which will be assessed, measured, and reported by the borrower;
B. **Project Evaluation and Selection Process:** The green loan borrower must explain how it organizes the evaluation and selection of projects that will receive the loan proceeds. Additionally, the borrower must explain how it will manage the environmental and social risks of eligible projects;
C. **Proceeds Management:** Green loan proceeds must be deposited into a dedicated account or tracked by the borrower to maintain transparency and promote the integrity of the product;
D. **Reporting:** The principles recommend the use of qualitative performance indicators and, where possible, quantitative performance measures (e.g., energy capacity, electricity generation, greenhouse gas emission reduction/avoidance, etc.) (world bank group, 2021).

The Green Loan Principles are based on and refer to the Green Bond Principles, aiming to promote consistency across financial markets. These principles address how to implement proceeds-use financing through bonds and loans. In 2018, the International Finance Corporation (IFC) adopted these principles to help clients attract additional financing to make a significant contribution to environmental goals.

This contribution is assessed through an independent second-party opinion that examines the proposed use of proceeds and compares it to qualifying activities listed in the Green Loan Program (GLP) and supplemental scientific information. Through Green Loans, the IFC works with clients to develop a Green Finance Framework, which outlines how the client's governance and management systems can be used to track, manage, and report on the use of proceeds so that they are allocated only to qualifying green projects. This framework is reviewed by a second-party opinion provider that offers independent confirmation that the loan aligns with the Green Loan Principles (world bank group, 2021).

3-4 Areas of employing green loans in environment projects:

The Green Credit program is designed to promote various environmental activities, and these activities include but are not limited to:

a) Tree plantation to increase the country's green cover.
b) Water management for conservation, harvesting, and efficient use.
c) Sustainable agriculture to promote natural and regenerative practices.
d) Waste management to encourage sustainable practices.
e) Air pollution Reduction measures.
f) Mangrove conservation and restoration.
g) Ecomark label development to incentivize manufacturers to obtain an Ecomark label for eco-friendly goods and services.

h) Sustainable building and infrastructure to encourage environment-friendly construction practices (RV IAS, 2025).

4- The impacts of investing in green loans:

Under the Green Loan Principles, information on the use of a green loan's proceeds is reported annually to the institutions participating in the loan. The GLP also recommends an external review process. However, self-certification by a borrower or investor with the technical expertise to confirm alignment of the green loan with the key features of the GLP is deemed sufficient. In practice, Loan Agreements for an IFC green loan include the client's obligations to report annually on the allocation of use of proceeds and select impact indicators. The IFC requires a second opinion confirming alignment with the GLP. This requirement is waived in cases where 100% of the proceeds are used to finance third-party certified green buildings or renewable energy projects.

5- The impact of green credit policy on firms:

Since the promulgation of "Green Credit Guidelines", relevant studies have analyzed the implementation effect of the policy and its impact on firms. On the one hand, green credit policy requires banks and financial institutions to tighten credit exposure to industries with "high pollution and high energy consumption" and industries with excess capacity. The green credit reduces energy consumption by controlling external financing, and restrain the blind expansion of polluting firms.

Therefore, some studies analyzed the impact of the policy from the perspective of credit allocation efficiency, and found that the policy restricted the financing of polluting firms, and this hindering effect is more pronounced in SOES and large firms. On the other hand, some studies explore the impact of green credit policy on firm performance and other aspects, and find that the policy improves the production efficiency of firms by stimulating technological innovation, promoting total factor productivity of listed companies. Green credit policy can guide capital flow to the environmental protection industry and support green innovation and production activities of firms. It can be seen that green credit plays an important role in promoting environmental protection and transforming the mode of economic development (Cong Li, Xueting , Xiujuan Li, & Yunxu , 2023).

6- Mechanisms for granting and directing green loans:

The process of granting green loans goes through several analytical stages, including: (Xiaotong Wang, et al., 2022)

A. **Defining Environmental Eligibility Criteria:** Loan approval is based on clear, pre-defined environmental rating criteria, such as clean energy or carbon reduction standards, to assess whether a project qualifies for green financing. These criteria are also used as part of the environmental and financial due diligence process before loan approval and are essential to ensuring that funding is directed towards projects with a tangible environmental impact.

B. **Integrating Regulatory Policies and Incentives:** Government policies, such as China's Green Credit Guidelines, require banks to consider sustainability criteria when granting loans. This diverts resources away from polluting projects and increases funding for clean projects. In the European context, green loans are also guided by a regulatory framework that includes legal obligations and central bank regulations to promote sustainability.

C. **Additional Assessment Tools and Techniques:** Some studies suggest using tools such as statistical models or extensive environmental screening to analyze risks and verify a project's compliance with green loan criteria. Banks also sometimes use ESG (Environmental, Social, and Governance) ratings to assess projects and determine the appropriate level of financial support.

III.An Analytical Study on the Role of Green Loans in Financing Environmental Projects (2020-2025)

1- Methodology :

This study adopts a descriptive-analytical approach based on international reports issued by the following institutions:

- Loan Market Association (LMA)
- World Bank
- Climate Bonds Initiative
- Organization for Economic Co-operation and Development (OECD)

- Global banking reports

Data covering the period 2020–2025 were used to analyze the evolution of green loans in terms of volume, trends, beneficiary sectors, and geographical distribution.

2- The Evolution of Green Loans:

By 2020–2025, the market for green loans and environmental bonds within sustainable lending reached over €907 billion, with only slight growth in the green loan segment compared to sustainability financing linked to corporate objectives. The figures indicate an increasing convergence between green finance and technology (green fintech) to support environmental projects through digital financial institutions and crowdfunding platforms.

Statistics point to rapid growth in the green loan market. The upward trajectory of growth rates in recent years confirms that green finance is no longer a circumstantial trend but has become a strategic component of global financial policies. The relative dominance of green loans reflects the role of banks as a key driver of financing the environmental transition, in contrast to the gradual development of the green bond market. This is illustrated in the **table n°** 1

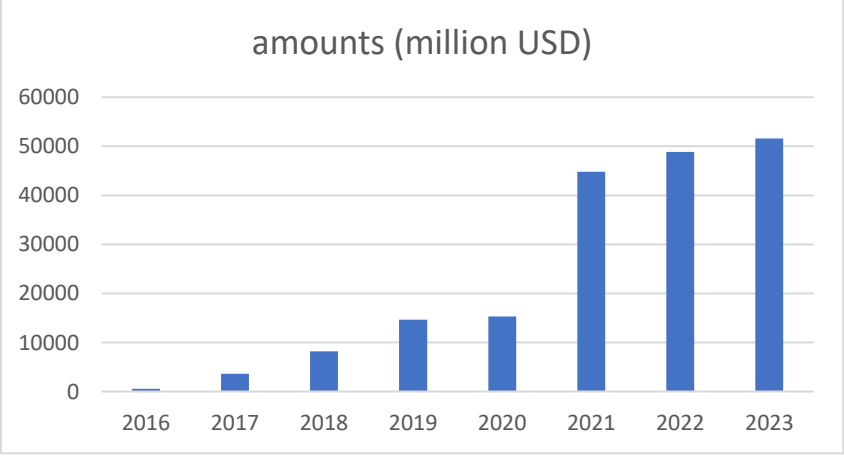
Table 1 : The size of green loans has evolved globally

years	2016	2017	2018	2019
amounts	567,17	3613,41	8174,05	14630,21
years	2020	2021	2022	2023
amounts	15295,16	44825,09	48818,51	51573,65

Source : (Trung Hoang, Benbouzid, Mallick, & Stojanovic, 2026)

Data recorded between 2016 and 2023 indicates significant growth in the value of green loans granted globally, rising from 567,17 US$ million in 2016 to 51.573,65 US$ million in 2023. This sustained increase reflects the growing interest in sustainable finance as a strategic tool to support major environmental projects and indicates the adoption of green loans by financial institutions as an effective mechanism for promoting sustainability and clean energy goals. Between 2016 and 2019, loans grew gradually from 567,17 US$million to 14.630,21 US$ million, a 25,8-fold increase over four years. This reflects the establishment and spread of green finance, with a focus on pilot projects and initial initiatives. During this period, the compound annual growth rate was high, reflecting the increasing interest of financial institutions and large corporations in adopting environmentally friendly financing instruments. However, the overall volume of loans had not yet reached maturity.

Figure 1 : The size of green loans has evolved globally



After 2020, green loans experienced a marked acceleration, increasing from **USD 15,295.16 million** to **USD 51,573.65 million** in 2023, representing a substantial surge over only three years. This rapid growth reflects the pivotal role of national and international government policies in supporting the green economy, alongside the impact of post-COVID-19 financial stimulus programs that enhanced firms' access to sustainable financing.

This increase can also be attributed to the expansion of large-scale environmental projects, including renewable energy and green infrastructure initiatives, which require higher levels of financing compared to traditional loans. The continued growth of green lending after 2020 indicates strengthened confidence in green loans as a long-term financial instrument and their capacity to generate tangible economic and environmental impacts.

Furthermore, the observed year-to-year variation suggests a transition of markets from an initial developmental phase to a stage of maturity and rapid growth, enabling the projection of a sustained upward trend in the coming years. The table also demonstrates that the global market has begun to incorporate environmental risk and opportunity assessment criteria into financing strategies, thereby supporting the development of more specialized financial instruments.

Researchers may infer that the increased focus on green loans is closely linked to the achievement of Sustainable Development Goals, particularly those related to clean energy and the circular economy. The rising growth trend indicates that financial institutions and large corporations are increasingly capable of integrating environmental considerations into their financing strategies.

Additionally, the annual increase in green lending highlights the importance of linking green loans with other market instruments, such as green bonds and government grants, to ensure broader financial inclusion and sustainable impact. The data reveal a global expansion in the adoption of green loans, accompanied by improved financial viability of major environmental projects.

Moreover, the table illustrates the role of green loans in promoting long-term investments in sustainable infrastructure compared to conventional financial instruments. It can be argued that the rising annual loan values also reflect the development of a sustainable finance culture within the banking sector and financial institutions.

Overall, the analysis indicates a clear upward trend, with notable acceleration after 2020, reflecting structural transformations in the global green finance market. Finally, these findings highlight the necessity of continuously strengthening regulatory frameworks and encouraging financial innovation to support the expansion of green loans and ensure access to financing for diverse environmental projects across countries and economic sectors.

Table 2 Evolution of green loan and green bond rates

Years	green bonds	Green loans
2018	2.3	3.7
2019	2.0	3,4
2020	1,5	3,1
2021	1,5	2,0
2022	2,7	3,8
2023	3,8	6,2

Source: (Trung Hoang, Benbouzid, Mallick, & Stojanovic, 2026)

The table illustrates the evolution of growth rates for both green loans and green bonds over the period **2018–2023**, revealing two main phases:

1. Slowdown phase (2018–2021). During this period, indicators show a gradual decline in growth rates. Green loan growth decreased from **3.7% in 2018** to **2.0% in 2021**, while green bonds declined from **2.3% to 1.5%** over the same period. This slowdown can be attributed to:

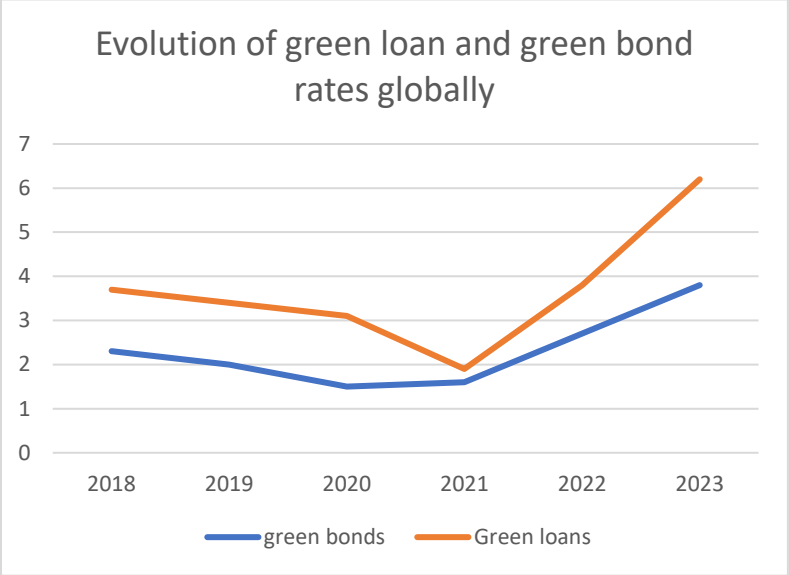
- Global economic uncertainty.

- The impact of the COVID-19 pandemic on financing and investment flows.
- Financial institutions' cautious approach to financing long-term, high-risk projects.

2. Recovery and acceleration phase (2022–2023). Starting in 2022, a clear reversal in trend is observed. Green loan growth increased to **3.8%** and then surged to **6.2% in 2023**, while green bonds recorded growth from **2.7% to 3.8%**. This shift can be explained by:

- Increased government commitments to achieving carbon neutrality targets.
- Expansion of incentive policies for sustainable finance.
- Rising global demand for environmentally responsible investments (ESG).

Figure 2 : Evolution of green loan and green bond rates globally



Source: Prepared by the two researchers based on Table No.

The data also indicate a sustained outperformance of green loan growth rates compared to green bonds throughout the study period, reflecting:

- The flexibility of green loans and their ease of allocation to small and medium-sized projects.
- Banks' preference for direct lending instruments over capital market mechanisms.
- The limited penetration of green bonds in some emerging economies due to the shallow depth of financial markets.

The results point to a structural shift in the environmental finance system, characterized by:

- Strengthening the role of the banking sector in the transition toward a green economy.
- Growing investment awareness of the importance of sustainable financing instruments.
- A strong linkage between the growth of green finance and the achievement of Sustainable Development Goals as well as international climate commitments.
- This trend reflects an increasing institutional awareness of the importance of green finance, as it evolves from a voluntary tool into a strategic component of investment decision-making.

1. Sectoral Distribution of Green Loans

Studies show that the green loan market exhibits a clear sectoral concentration in favor of renewable energy and energy efficiency, reflecting global priorities in combating climate change. However, the relatively low share of sectors such as green buildings and natural resource management indicates the persistence of financial and regulatory barriers that continue to constrain investment expansion in these areas.

The results presented in the table indicate that banks and financial institutions adopt a selective approach based on risk–return considerations, whereby the majority of green loans are directed toward sectors with high economic feasibility and strong regulatory support. This distribution also reflects a strong linkage between climate policies and credit decisions, confirming the transition of green finance from a phase of symbolic initiatives to one of structural integration within banking strategies.

From an environmental economics perspective, this distribution emerges as an effective mechanism for achieving allocative efficiency of financial resources, as capital is channeled toward activities that generate the highest environmental impact per unit of financing. Moreover, this orientation contributes to narrowing the climate finance gap, particularly in high-emission sectors.

Table 3: Global sectoral distribution of green loans

sector	Funding percentage	The amounts are estimated (billion dollars).
Renewable energy	38	76
Energy efficiency	21	42
Sustainable transport	17	34
Water and waste management	14	28
Green buildings	10	20

Source: (Trung Hoang, Benbouzid, Mallick, & Stojanovic, 2026)

The sectoral distribution of green loans reflects profound structural shifts in international financing trends toward sectors that contribute most significantly to achieving the Sustainable Development Goals and carbon neutrality. The data show that the **renewable energy sector** accounts for the largest share, at **38%**, confirming its strategic importance in global energy transition policies. This dominance is attributed to the high investment requirements of solar, wind, and green hydrogen projects, in addition to regulatory support and government incentives that have made this sector particularly attractive to financial institutions.

The **energy efficiency sector** ranks second, with a share of **21%**, reflecting growing awareness of the importance of rationalizing energy consumption across industrial, residential, and service sectors. This approach is considered one of the most cost-effective tools for reducing carbon emissions compared to capital-intensive technological projects, which explains the relatively high proportion of financing directed toward it.

The **sustainable transport sector**, which accounts for **17%** of total green loans, is directly linked to policies promoting electric vehicles and the development of low-emission public transport infrastructure. This share confirms that financial institutions are increasingly prioritizing this sector due to its central role in reducing urban carbon footprints and improving air quality.

In contrast, the **water and waste management sector** represents **14%**, reflecting a growing recognition of the importance of sustainable natural resource management in the context of climate change and water scarcity. This sector has been experiencing gradual growth driven by stricter environmental regulations and rising demand for circular economy solutions.

Finally, the **green buildings sector** accounts for **10%** of total financing, a figure that reflects the transitional phase this sector is still undergoing, despite its importance in reducing energy consumption and construction-related emissions. This relatively lower share is attributed to the high costs of complying with environmental standards and the difficulty of harmonizing green classification criteria globally.

2. Geographical Distribution of Green Loans

The geographical analysis of green loans highlights a structural imbalance in the allocation of sustainable finance, with the largest share concentrated in major economies. This pattern underscores the need to strengthen international supportive frameworks to enable less-benefited regions to achieve effective integration into the global green finance system.

Table 4 : Global geographical distribution of green loans (2023–2025)

Region / Country	Approximate Share of Total Green Loans (%)	Notes
China	35	The largest global green loan market, supported by strong government policies and encouragement for banks to finance
European Union	28	Characterized by advanced regulatory frameworks and climate strategies that require institutions to adhere to sustainability.
United States	15	Experiencing rapid growth in green finance, particularly in renewable energy and green buildings
Middle East and North Africa (MENA)	6	Gradual expansion with improvements in legal frameworks and incentives for banks to issue green loans
Asia (excluding China)	8	Countries such as India and South Korea are increasing their share in environmental financing
Latin America	5	Limited but ongoing growth, especially in water and renewable energy sectors.
Sub-Saharan Africa	3	Small-scale clean energy financing, but increasing with support from international institutions.

Source: (International Finance Corporation, 2023), (Climate Bonds, 2026), (Climate Policy Initiative, 2026), (LONG FINANCE AND FINANCIAL CENTRE FUTURES, 2025)

The geographical distribution of green loans reflects a pronounced disparity in the capacity of economic regions to mobilize sustainable financing, a disparity closely linked to financial development, regulatory frameworks, and commitment to climate policies. Data indicate that China leads the global landscape with a share of approximately 35% of total green loans, highlighting the country's pivotal role in financing the energy transition. This concentration is attributed to China's national strategy, which integrates green finance into industrial and credit policies, coupled with the direct intervention of public and quasi-public financial institutions in directing credit toward low-carbon projects.

The European Union ranks second with 28%, reflecting the maturity of its institutional and regulatory framework for sustainable finance, particularly through the adoption of a unified EU taxonomy for green activities and the alignment of credit policies with climate objectives. This relative weight underscores that green loans have become a central tool for implementing the European Green Deal and achieving carbon neutrality targets.

The United States, with a 15% share of total green loans, demonstrates a relatively lower presence compared to its global economic weight. This is partly explained by its greater reliance on capital market instruments, particularly green bonds, and the decentralized nature of its environmental and financial policies, despite notable improvements in recent years following the introduction of broad climate investment incentives.

In contrast, the Middle East and North Africa (MENA) region accounts for only 6%, reflecting the limited integration of green loans into regional banking systems despite substantial potential in renewable energy. This is due to continued reliance on traditional carbon-intensive sectors and weak regulatory frameworks supporting sustainable finance.

Asia (excluding China) represents 8%, a share that reflects significant heterogeneity across the region, with relatively advanced economies leading in green finance adoption, whereas developing economies lag due to high investment risks and underdeveloped financial structures. Latin America and Sub-Saharan Africa, with shares of 5% and 3% respectively, epitomize the global climate finance gap. Despite the urgent need for investment in climate adaptation and sustainable infrastructure, limited access to finance, high capital costs, and weak credit guarantees constitute structural barriers to the expansion of green loans in these regions.

These findings indicate that the green loan market is highly geographically concentrated in favor of major economies with advanced regulatory frameworks, raising issues of equity in climate finance distribution. They also underscore the critical role of public policies and national financial institutions in channeling credit flows toward sustainable activities. Accordingly, narrowing the geographical gap in green finance requires more effective international mechanisms for risk-sharing and strengthening the banking capacities of developing economies.

3. Number of Green Loans by Country

With the increasing global focus on transitioning to a green economy, the prevalence of green loans is expected to rise in emerging markets and smaller European economies, particularly with the adoption of supportive financial policies and regulatory frameworks that encourage corporate sustainable financing.

The accompanying table presents the distribution of 439 green loans, totaling USD 187,497.27 million, across 38 countries, revealing a marked disparity in both the number and value of loans among these countries.

Table 5 : Distribution of green loans globally by country

Country	Number of Loans	Value (USD Million)
United States	53	36,884.76
Japan	79	16,917.83
Spain	47	16,814.17
Germany	12	15,021.82
United Kingdom	17	12,851.36
Hong Kong	33	11,572.67
Canada	12	8,863.09
Italy	8	6,223.44
Saudi Arabia	7	5,663.24
India	7	4,369.22
Other Countries	164	42,576.91
Total	**439**	**187,497.27**

Source : (Trung Hoang, Benbouzid, Mallick, & Stojanovic, 2026)

The analysis highlights the need to strengthen the integration of green loans with other market instruments to ensure that financing reaches various sectors and countries, thereby supporting sustainability and clean energy objectives. Several key observations emerge from the analysis:

The majority of green loans are concentrated in the United States, Japan, Spain, and Germany, which together account for approximately 46% of the total loan value, despite the number of loans in these countries not exceeding 191 out of a total of 439 loans. This indicates that these countries rely on high-value loans to support major sustainability projects, reflecting the size of their financial markets and the readiness of both the public and private sectors to adopt green finance.

The table also reveals significant disparities between countries in both the number of loans and their financial value: some countries, such as Belgium, Greece, and Switzerland, recorded very few loans with low total values (< USD 650 million), reflecting the limited use of loans as a financing tool for environmental projects in these countries. In contrast, Japan and the United States registered the highest number of loans with substantial values, demonstrating clear incentive policies toward green finance.

It can be observed that the number of loans does not always correlate with their total financial value:

- Japan recorded the highest number of loans (79) totaling USD 16,917.83 million, whereas the United States issued 53 loans with a significantly higher total value of USD 36,884.76 million.

- This indicates differences in project structures, where some countries rely on numerous medium-sized loans, while others focus on fewer but financially larger loans.

The concentration of loans in specific countries also reflects reliance on advanced financial infrastructure, with specialized banks and financial institutions for green lending, in addition to supportive government policies. Countries with low loan values may resort to alternative financing instruments, such as green bonds or government grants, to promote sustainability, consistent with previous observations regarding the preference for capital market instruments in certain nations.

Conclusion

The study's findings indicate that green loans have played a pivotal role in financing environmental projects during the 2020–2025 period, with a notable increase in their annual value, reflecting the growing global adoption of sustainable finance. The results show a clear concentration in countries with advanced financial infrastructure, with significant variation across economic sectors: public utilities benefited the most, followed by real estate and industrial services, while the conventional energy sector received a smaller share. This distribution reflects environmental and strategic priorities in the allocation of sustainable financial resources.

The study confirms that green loans are an effective tool for enhancing companies' capacity to implement long-term projects aligned with sustainability objectives, while also strengthening institutional and investor confidence in the green economy. Accordingly, there is a pressing need to develop supportive policies, integrate other sustainable financing instruments, and standardize metrics for assessing the impact of these loans, thereby ensuring tangible economic and environmental outcomes over the long term.

Results

The study's findings confirm that green loans have played a pivotal role in financing environmental projects during the 2020–2025 period, with a marked increase in their annual value from USD 15,295 million in 2020 to USD 51,574 million in 2023. This growth reflects an accelerated adoption of sustainable finance following the COVID-19 pandemic, driven by heightened attention to the green economy and the encouragement of national and international policies promoting investment in clean energy and major environmental projects.

Analysis of the geographical distribution of loans revealed a clear concentration in the United States, Japan, Spain, and Germany, indicating that markets with advanced financial infrastructure and supportive policies are best positioned to adopt green loans. The results also showed that some European countries, such as Belgium, Greece,

and Switzerland, recorded lower loan shares, reflecting a preference for alternative financing instruments, such as green bonds and government grants, to support environmental projects.

In terms of economic sectors, public utilities benefited the most from green loans, followed by real estate and industrial and commercial services, while the conventional energy sector received a smaller share, reflecting a focus on financing sustainable projects with tangible environmental impact. The study also highlighted that the adoption of green loans contributes to enhancing institutional confidence in sustainable finance and increases companies' capacity to implement long-term projects that achieve sustainable development goals.

Key findings include:

- **Steady growth in green loans:** Annual loan values increased from USD 15,295 million in 2020 to USD 51,574 million in 2023, reflecting rapid expansion in sustainable finance after the COVID-19 pandemic.

- **Clear geographical concentration:** The United States, Japan, Spain, and Germany captured the largest share of green financing, reflecting the ability of advanced markets to implement large-scale environmental projects.

- **Disparities among countries:** Some smaller European countries recorded lower loan shares, often due to the preference for alternative financing instruments such as green bonds and government grants.

- **Sectoral distribution:** Public utilities received the largest share of loans, followed by real estate and industrial services, while the conventional energy sector had a smaller share, reflecting the allocation of financing toward high-impact environmental projects.

- **Accelerated growth post-2020:** Loans experienced a marked acceleration, reflecting the effect of national and international policies supporting the green economy and sustainable energy.

- **Enhanced institutional confidence:** Companies and financial institutions relied on green loans as a reliable tool to implement long-term projects and achieve sustainability objectives.

- **Financial and strategic impact:** Green loans facilitated the development of sustainable infrastructure and linked financing to environmental initiatives and the circular economy.

- **Promising future outlook:** Continued growth indicates the potential for global expansion of green loans, with increasing inclusion of sectors and countries that have previously benefited less.

Suggestions

The study confirms that green loans are not merely a financing instrument but represent a strategic mechanism to advance the transition toward a low-carbon economy and support major environmental projects. Sustained growth in this sector requires effective collaboration among governments, financial institutions, and investors to ensure long-term economic and environmental impact. Accordingly, we propose the following recommendations:

1. **Strengthen regulatory frameworks and supportive policies:** Governments should establish clear financial policies and legislation that encourage the issuance of green loans, complemented by tax incentives and benefits for sustainable companies.

2. **Integrate sustainable financing instruments:** Green loans should be combined with green bonds and government grants to ensure financing reaches all sectors, including small and medium-sized enterprises.

3. **Develop innovative financial products:** The banking sector and financial institutions should design innovative financing instruments that account for environmental and social risks, enhancing investment efficiency in sustainable projects.

4. **Standardize measurement and evaluation criteria:** Adoption of unified standards to assess the environmental and economic impact of green loans is essential to increase transparency and strengthen investor confidence.

5. **Promote analytical studies and continuous monitoring:** Regular assessment of the impact of green loans on sustainable development, linked to environmental and economic performance indicators, is necessary to support strategic decision-making.

6. **Expand financing in developing and emerging countries:** Improve access to green loans in under-served countries through international support and funding programs, promoting a global transition to a low-carbon economy.

7. **Enhance public-private sector collaboration:** Encourage partnerships among governments, financial institutions, and companies to broaden sustainable financing and implement long-term environmental projects.

8. **Raise awareness and build capacity:** Implement training programs and workshops to enhance companies' and investors' understanding of the importance of green finance and how to utilize it effectively.

Ethical Considerations

This study is analytical and descriptive in nature and is based exclusively on secondary data obtained from publicly available sources, including official statistical reports, policy documents, and published financial and environmental studies. No primary data were collected, and no human participants, personal data, confidential information, or institutional review processes were involved. Consequently, ethical approval was not required. Nevertheless, the authors adhered to the principles of academic integrity, transparency, and responsible research conduct throughout all stages of the study, including proper citation of sources and objective data interpretation.

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Author Contributions

Dr. **Morsli Donia** conceptualized the study, developed the theoretical framework, and contributed to data analysis and interpretation.
Dr. **Boukabous Meriem** contributed to the literature review, analytical methodology, data collection, and drafting of the manuscript.
Both authors jointly reviewed, edited, and approved the final version of the manuscript and take full responsibility for its content.

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IV.Bibliographie

1. Climate Bonds Initiative. (2026, January 9). *Certified climate bonds dataset.* https://www.climatebonds.net/data-insights/market-data/certified-climate-bonds-database
2. Climate Policy Initiative. (2024). *Global landscape of climate finance 2024.* https://www.climatepolicyinitiative.org/publication/global-landscape-of-climate-finance-2024/
3. International Finance Corporation. (2023). *Green finance: A bottom-up approach to track existing flows.* International Finance Corporation.
4. Long Finance & Financial Centre Futures. (2025). *Global Green Finance Index 15.* https://www.longfinance.net/media/documents/GGFI_15_Report_2025.04.24_v1.0.pdf
5. Trung Hoang, B., Benbouzid, N., Mallick, S., & Stojanovic, A. (2026). Green loans and firm performance: Evidence on signalling and impact investing effects. *European Financial Management*, 32(2), 288–312. https://doi.org/10.1111/eufm.xxxxx
6. Bae, K. H., El Ghoul, S., Gong, Z., & Guedhami, O. (2021). Does CSR matter in times of crisis? Evidence from the COVID-19 pandemic. *Journal of Corporate Finance, 67*, 101876. https://doi.org/10.1016/j.jcorpfin.2020.101876

7. Flammer, C. (2021). Corporate green bonds. *Journal of Financial Economics, 142*(2), 499–516. https://doi.org/10.1016/j.jfineco.2021.01.010
8. Gangi, F., Meles, A., Monferrà, S., & Mustilli, M. (2019). Does corporate social responsibility help the survivorship of SMEs? *Corporate Social Responsibility and Environmental Management, 26*(4), 978–989. https://doi.org/10.1002/csr.1736
9. Bergset, L., & Fichter, K. (2015). Green start-ups: A new typology for sustainable entrepreneurship. *Journal of Innovation Management, 3*(3), 118–144.
10. Clark, G. L., Feiner, A., & Viehs, M. (2015). From the stockholder to the stakeholder. *Oxford Review of Economic Policy, 31*(1), 1–22. https://doi.org/10.1093/oxrep/grv002
11. Friede, G., Busch, T., & Bassen, A. (2015). ESG and financial performance. *Journal of Sustainable Finance & Investment, 5*(4), 210–233. https://doi.org/10.1080/20430795.2015.1118917
12. Bose, S., Khan, H. Z., Rashid, A., & Islam, S. (2018). What drives green banking disclosure? *Journal of Cleaner Production, 196*, 1541–1555. https://doi.org/10.1016/j.jclepro.2018.06.120
13. Ghosh, S. (2018). Green banking: A new frontier in sustainable development. *International Journal of Banking, Accounting and Finance, 9*(2), 112–127.
14. Weber, O. (2017). Corporate sustainability and financial performance. *Journal of Sustainable Finance & Investment, 7*(2), 99–112. https://doi.org/10.1080/20430795.2016.1255995
15. Campiglio, E. (2016). Beyond carbon pricing. *Ecological Economics, 121*, 220–230. https://doi.org/10.1016/j.ecolecon.2015.12.020
16. Nguyen, T. T., Naeem, M. A., Balli, F., Balli, H. O., & Vo, X. V. (2021). Time-frequency connectedness among green bonds. *Energy Economics, 99*, 105287. https://doi.org/10.1016/j.eneco.2021.105287
17. Sachs, J. D., Woo, W. T., Yoshino, N., & Taghizadeh-Hesary, F. (2019). *Why is green finance important?* Asian Development Bank Institute.
18. European Commission. (202. *EU taxonomy for sustainable activities*. https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/eu-taxonomy-sustainable-activities_en
19. Organisation for Economic Co-operation and Development. (2020). *Developing sustainable finance definitions and taxonomies*. OECD Publishing. https://doi.org/10.1787/134a2d3f-en
20. United Nations Environment Programme Finance Initiative. (2022). *Principles for responsible banking*. UNEP FI.
21. World Bank. (2020). *Green bonds impact report*. World Bank Group.
22. Chen, Y., Hung, M., & Wang, Y. (2018). The effect of mandatory CSR disclosure. *Journal of Accounting and Economics, 65*(1), 1–20.
23. Li, Z., Tang, Y., & Wang, K. (2023). Green credit and firm innovation. *Energy Economics, 115*, 106321. https://doi.org/10.1016/j.eneco.2022.106321
24. Zhang, D., Mohsin, M., Rasheed, A. K., Chang, Y., & Taghizadeh-Hesary, F. (2021). Public spending and green economic growth. *Environmental Science and Pollution Research, 28*, 55647–55661. https://doi.org/10.1007/s11356-021-14700-1