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# THE IMPACT OF ARTIFICIAL INTELLIGENCE AND SMART CONTRACTS ON ESG FINANCE AND HUMAN RIGHTS

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**Abstract**
Access to financial resources by individuals, corporations, and governments must undergo impact assessments concerning human rights. Public and private governance bodies exert influence over the global financial landscape, ensuring compliance with frameworks such as the UN's 2030 SDGs through the "Equator Principles" and the "Principles for Responsible Investment." The article aims to analyze the effects of digital tools on responsible financing, such as through the decentralization of financial systems for credit access. It explores the use of artificial intelligence (AI) integrated into "smart contracts," the consumer credit market, especially on peer-to-peer lending platforms, and other fintech solutions for achieving ESG goals like poverty reduction. However, the use of AI and "smart contracts" may also pose risks to human rights. The study employed a systematic literature review, examining recent articles on ESG finance, disruptive technologies, and human rights. Methodologically, it incorporated document analysis of international frameworks (SDGs, Equator Principles, UNPRI), case studies of financial institutions and fintech platforms (e.g., Grameen Bank, BRAC, Tala App), quantitative analysis of digital financial market trends, and an interdisciplinary lens combining legal, economic, and technological perspectives. The expected outcome is a contribution to identify recent trends and challenges related to corporate social responsibility in the financial sector, particularly regarding human rights in the digital era. The specifical contributions are some theoretical innovations in new frameworks and hypothesis formulation, empirical findings in market data and case studies, methodological advances in interdisciplinary approaches, policy insights due to regulatory gap analysis, technology-specific analysis like AI bias and disruptive technologies potential, social impact documentation about vulnerable population effects and future research pathways in regulatory and technological directions.

**Keywords**
ESG. human rights. Fintech. financial markets. smart contracts. artificial intelligence.

**Resumen**
El acceso a recursos financieros por parte de individuos, corporaciones y gobiernos debe pasar por evaluaciones de impacto en relación con los derechos humanos. Los organismos de gobernanza pública y privada ejercen influencia sobre el panorama financiero global, garantizando la conformidad con marcos como los ODS de la ONU para 2030 a través de los "Principios del Ecuador" y los "Principios para la Inversión Responsable". El artículo tiene como objetivo analizar los efectos de las herramientas digitales en el financiamiento responsable,

como la descentralización de los sistemas financieros para el acceso al crédito. Se explora el uso de inteligencia artificial (IA) integrada en "contratos inteligentes", el mercado de crédito al consumo, especialmente en plataformas de préstamos "peer-to-peer" y otras soluciones "fintech" para la concreción de la agenda ESG, como la reducción de la pobreza. Sin embargo, el uso de IA y "contratos inteligentes" también puede traer riesgos para los derechos humanos.. El estudio empleó una revisión sistemática de literatura, analizando artículos específicos y recientes sobre finanzas ESG, tecnologías disruptivas y derechos humanos. La metodología incluyó: análisis documental de instrumentos internacionales (ODS, Principios de Ecuador, UNPRI); estudios de caso de instituciones financieras y plataformas fintech (Grameen Bank, BRAC, Tala App, entre otros); análisis cuantitativo de datos sobre el crecimiento del mercado financiero digital y tendencias ESG; y un enfoque interdisciplinario que integra perspectivas legales, económicas y tecnológicas. El resultado esperado es un análisis integral de las principales tendencias y desafíos recientes relacionados con la responsabilidad social corporativa en el sector financiero, especialmente en lo que respecta a los derechos humanos en la era digital. Los aportes específicos incluyen innovaciones teóricas en nuevos marcos y formulación de hipótesis, hallazgos empíricos en datos de mercado y estudios de caso, avances metodológicos en enfoques interdisciplinarios, análisis de políticas públicas por brechas regulatorias, estudios específicos sobre tecnologías (como sesgos en IA y potencial de tecnologías disruptivas), documentación de impacto social en poblaciones vulnerables y líneas futuras de investigación en regulación y tecnología.

**Palabras clave**

ESG. derechos humanos. Fintech. mercados financieros. contratos inteligentes. inteligencia artificia.

**Resumo**

O acesso a recursos financeiros por indivíduos, corporações e governos devem passar por avaliações de impacto em relação aos direitos humanos. Órgãos de governança pública e privada exercem influência sobre o cenário financeiro global, garantindo a conformidade com estruturas como os ODS da ONU para 2030 por meio dos “Princípios do Equador” e os "Princípios para o Investimento Responsável". O artigo tem como objetivo analisar os efeitos das ferramentas digitais no financiamento responsável, v.g. pela descentralização dos sistemas financeiros para acesso ao crédito. Explora-se o uso de inteligência artificial (IA) integradas em "contratos inteligentes", o mercado de crédito ao consumidor, especialmente em plataformas de empréstimos “peer-to-peer” e outras soluções "fintech" para a concretização de agenda ESG como a redução da pobreza. Porém o uso de IA e "contratos inteligentes" também pode trazer riscos aos direitos humanos. O estudo utilizou uma revisão sistemática da literatura, analisando artigos específicos e recentes sobre finanças ESG, tecnologias disruptivas e direitos humanos. A metodologia incluiu análise documental de instrumentos internacionais (ODS, Princípios do Equador, UNPRI); estudos de caso de instituições financeiras e plataformas fintech (Grameen Bank, BRAC, Tala App, entre outros); análise quantitativa de dados sobre o crescimento do mercado financeiro digital e tendências ESG; e uma abordagem interdisciplinar que integra perspectivas jurídicas, econômicas e tecnológicas. O resultado esperado é uma análise abrangente das principais tendências e desafios recentes relacionados à responsabilidade social corporativa no setor financeiro, especialmente no que diz respeito aos direitos humanos na era digital. As contribuições específicas incluem inovações teóricas em novas estruturas e formulação de hipóteses, descobertas empíricas em dados de mercado e estudos de caso, avanços metodológicos em abordagens interdisciplinares, insights de políticas públicas por análise de lacunas regulatórias, análise específica de tecnologias (como viés em IA e potencial de tecnologias disruptivas), documentação de impacto social em populações vulneráveis e caminhos futuros de pesquisa em direções regulatórias e tecnológicas.

**Palavras-chave**

ESG. direitos humanos. Fintech. mercados financeiros. contratos inteligentes. inteligência artificial.

## 1. INTRODUCTION

Among the multiple facets of the digital transformations in the last decades, new financial products have been created, with direct impacts on fundamental rights. The United Nations' Sustainable Development Goals (SDGs) and other commitments like the Addis Ababa Agenda alert about many financial activities risks to human rights, calling banks to account for responsible financing.

Digital technologies, especially artificial intelligence with the use of smart contracts in a blockchain environment, are already being applied in the financial sector, including decentralized finance (DeFi), considered an important dimension of responsible financing and investment.

The SDGs changed the notions of public and private governance to include environmental, social and governance (ESG) principles. Business with negative impacts on stakeholders should be avoided and this discourse is replied by central and development banks, as well as by private institutions' policies all over the world.

Socially responsible investments (SRI) are associated with a broader consideration on investor concerns beyond the profit goals in capital markets as well. The United Nations Principles for Responsible Investment (UNPRI), is a network of investors supported by the UN that seeks to promote sustainable investment and to define which assets should enter the portfolio not only by financial performance but also seeking governance to social and environmental results.

New questions arise with artificial intelligence (AI) and smart contracts in the fintech field. The use of so-called disruptive technologies in the current forms of hetero and selfregulation in business are increasing, with unprecedented challenges. Case studies and literature reveal that the use of AI in credit and microcredit programs show positive results in DeFi agenda and social inclusion ultimately, but it has a high risk of discriminatory bias, v.g., affecting the ESG standards.

Recent research reviews blockchain functionalities and smart contracts associated with AI in finance, and some selected topics such as the blockchain decentralized operations and its relationship with DeFi. The regulatory network on business integrity and ESG finance is huge, but at least it's possible to identify problems and guidelines in the contemporary debate, shedding light on future developments in a main topic: the social responsibility of financial and investment actors, with or without the use of fintech

(financial technology), must be thoroughly regulated. Moreover, some regulations may traverse the contractual chains in cascade.

From environmental issues in energy generation and consumption, through supply and service chains, to institutions with decision-making power over credit and investment, there must be responsible use of AI and smart contracts to protect those who suffer the impacts of the digital age.

Therefore, through a review of specific and recent articles on the main theme, this paper seeks to bring articulated contributions on the real impacts technologies may have to enhance ESG finance and promote responsible investment practices and, at the same time, evaluate their significant risks to human rights in the corporate social responsibility contemporary practices.

The main hypothesis is that financial institutions, regardless of their nature, purpose, and size, must demonstrate critical responsibility in credit analysis and project financing, as the international community and civil society increasingly scrutinize institutions that operate within corporate value chains associated with human rights risks or violations. Disruptive technologies (AI, blockchain, and smart contracts) can simultaneously enhance ESG finance through democratization of credit access and improved transparency, while also introducing new systematic risks of discrimination and human rights violations, requiring specific regulatory frameworks to ensure that financial technological development is truly responsible and inclusive.

A first orbital hypothesis is that It is worth noting that financial products to human rights functions have still a profit-oriented "risk assessment" compared to operations without ESG concerns; therefore, social responsibility becomes effective only through collaborative efforts between governments and private interests. And a second sub-hypothesis linked to it shows that as financial and investment institutions seek to advance ESG agendas, new disruptive technologies present challenges not only by dissolving traditional hierarchies based on national legal frameworks and central authorities, but also by creating new power structures that favor programming experts over ethics and human rights specialists.

The investigation is justified by the urgency to understand the impacts of digital transformations in the financial sector on fundamental rights in a time of increasing AI nationbased hard regulation documents been approved. With the global digital lending market reaching $12.3 trillion in 2024 and decentralized finance (DeFi) representing $55 billion, it becomes crucial to assess how these technologies can serve the UN Sustainable Development Goals. Social relevance manifests in the need to protect vulnerable populations from algorithmic discriminatory practices, while leveraging the inclusive

potential of these technologies to reduce poverty and promote sustainable development, especially in emerging markets where digital microcredit can reach communities traditionally excluded from the formal financial system.

The theoretical framework of this study is grounded in the convergence of three main fields: Business and Human Rights Theory, based on the UN Guiding Principles on Business and Human Rights and corporate due diligence; Sustainable Finance Theory, supported by ESG (Environmental, Social, Governance) criteria and the UN Principles for Responsible Investment (UNPRI); and Financial Disruptive Innovation Theory, which examines how emerging technologies (AI, blockchain, smart contracts) transform traditional financial structures. The framework also integrates the Addis Ababa Agenda (2015) and the UN SDGs as normative references for responsible financing, considering both hard law and soft law regulatory approaches in global financial governance.

The research methodology employed systematic literature review, analyzing specific and recent articles on ESG finance, disruptive technologies, and human rights. The methodology included document analysis of international instruments (SDGs, Equator Principles, UNPRI); case studies of financial institutions and fintech platforms (Grameen Bank, BRAC, Tala App, among others); quantitative data analysis on digital financial market growth and ESG trends; and interdisciplinary approach integrating legal, economic, and technological perspectives. The study adopted a critical perspective to evaluate both potentials and risks of emerging technologies in the context of responsible financing and human rights protection.

Finally, the research demonstrates that disruptive technologies (artificial intelligence, blockchain, and smart contracts) present a paradoxical potential for ESG finance. On one hand, they can democratize access to credit and improve transparency in responsible investments; on the other, they carry significant risks of algorithmic discrimination and human rights violations. The study concludes that despite exponential growth in the digital finance market, the effectiveness of ESG practices remains limited, hard law regulation remains scarce, and voluntary guidelines (soft law) prevail lacking comprehensive human rights protection.

## 2. International Trends In Responsible Financing

There is clearly opposition between public and private interests and agents in general, but a good portion of the relationships established in finance involves interests and agents with public-private functions, like the IPO in stock exchanges, banks, and direct treasury operations.

As part of the national socioeconomic infrastructure, financial institutions encompass capital market transactions carried out with the function of promoting international credit, and therefore, a possible framework for analyzing the notion of responsible financing (SRI) or ESG finance can be divided into two branches: on one side, banks and credit institutions (public, private, and development); on the other side, institutional investors (funds and public or private companies) and individuals who seek credit or are participants in investment markets.

Social Responsibility in Investments (SRI) can be presented in a very similar way to the concept of corporate social responsibility: companies are required to act according to ESG criteria in areas such as debt control, ethical and green investments, microfinance and credit decentralization, and community involvement in the financed project's surroundings. In these examples, they directly touch the protection of human rights in their integrity and compliance concerns:

> Under this approach, major strides have been made in applying human rights to certain areas of finance: there have been high-profile campaigns and international initiatives around such issues as project finance, ethical investing, microfinance and corruption, to cite the most visible. (...) Most if not all the major banking organisations now have CSR teams in place who often report directly to the Chief Executive and who are responsible for implementing publicly available human rights policies. (Dowell-Jones, 2013. p. 424)

A broad and long-standing debate includes responsibility and sustainability to the development banks of nations and, henceforth, to the entire private financial system with internal regulation. In 2015, the United Nations approved the Addis Ababa Action Agenda, recording detailed financing guidelines for sustainable development and the protection of human rights:

> We commit to respecting all human rights, including the right to development. We will ensure gender equality and women's and girls' empowerment. We will promote peaceful and inclusive societies and advance fully towards an equitable global economic system in which no country or person is left behind, enabling decent work and productive livelihoods for all, while preserving the planet for our children and future generations. (UN, 2015, p. 02)

The broad spectrum of public and private banks activities comes along with new Social Development Goals of the UN, such as the Network for Greening the Financial System and the United Nations Environment Programme Finance Initiative, with more environmental concerns (UNDP, 2020, p. 163). Another example is the clear reorientation of investments and financing towards inclusion and gender inequality reduction purposes:

> We encourage impact investing, which combines a return on investment with non-financial impacts. We will promote sustainable corporate practices, including integrating environmental, social and governance factors into company reporting as appropriate, with countries deciding on the appropriate balance of

> voluntary and mandatory rules. We encourage businesses to adopt principles for responsible business and investing, and we support the work of the Global Compact in this regard. We will work towards harmonizing the various initiatives on sustainable business and financing, identifying gaps, including in relation to gender equality, and strengthening the mechanisms and incentives for compliance. (UN, 2020, p.12).

On the other hand, when we primarily analyze the impact of financing on communities and even society in general, we also need to analyze credit for companies and governments. In these cases, financing can show positive changes if it is directed at projects that follow ESG principles, as it can theoretically cover any financial product from any type of financial institution for any company or government project.

In the case of international financial institutions such as the IMF and the World Bank (WB), among others, the political debate about their role historically associated with austerity measures and neoliberal pressure and their indisputable role in economic boom or bust cycles is equally significant. Consequently, the role of these international institutions in respecting human rights and capacities is associated with the human and social development index. The historical effects of policies imposed by the IMF and WB are denounced as responsible for recessive cycles, with the consequent reduction of fundamental rights to health, work, and civil rights (Stubbs & Kentikelenis, 2020, p.173). So, there are arguments from the law and economics debate that point out a possible correlation between nations financing and greater effectiveness of human rights.

Then financial institutions, regardless of their nature, purpose, and size, must demonstrate critical responsibility in credit analysis and financing projects, as the international community and civil society increasingly oversee financial institutions that operate directly in corporate activities chains and flows associated with risks or damage to human rights (HARVEY, 2005, p.13).

Then, besides intergovernmental public-like institutions in the field, other important examples of these SRI trends come from multiple international sources with a private-like and “soft” guiding purpose. The set of principles called the Equator Principles is one of them and was developed to guide responsible financing. According to Andrew (2008, p.4), "the Equator Principles were developed by private lending institutions as a way to encourage private lenders to consider social and environmental issues before funding projects". The commitments of the Equator Principles are clear:

> We will fulfill our responsibility to respect Human Rights in line with the United Nations Guiding Principles on Business and Human Rights (UNGPs) by carrying out human rights due diligence; We support the objectives of the 2015 Paris Agreement and recognise that EPFIs have a role to play in improving the availability of climate-related information, such as the Recommendations of the

> Task Force on Climate-related Financial Disclosures (TCFD) when assessing the potential transition and physical risks of Projects financed under the Equator Principles; andWe support conservation including the aim of enhancing the evidence base for research and decisions relating to biodiversity. (TEP, 2011, p.3)

It is worth noting that linking financial products to human rights is also a profit-like "risk assessment" comparing to operations with no ESG concerns, then social responsibility only become effective in a joint role of governments and private interests:

> It should be considered whether the ESG and CSR principles can be applied by public, governmental and local administrations. Employee care, equal treatment, and appropriate remuneration in accordance with ESG and CSR principles have so far not been associated with improving the living conditions of socially excluded people such as former prisoners, disabled, homeless, and long-term unemployed people. The existence of the abovementioned social groups deprived of any sources of income, any job is socially negative. The text also concerns the issue of the possibility of extending the ESG and CSR principles to include the aspirations of entrepreneurs and public administration to eliminate the phenomenon of social exclusion permanently. (Gonet, 2021, p. 61).

One of the most evident ways to ensure those goals is to enforce clear sanctions to financial institutions that do not use due diligence measures to assess the risks of their projects. Recent studies point out to the lack of stringent sanctions and its effect on the multiple facets of financial field in the EU:

> The development of a more stringent regulatory framework, hence, represents a strong incentive for both financial and non- financial companies to implement policies based on sustainability. However, while banks are currently at an advanced stage in the green transition process, non-financial firms, including small and medium enterprises (SMEs), have only recently begun to integrate the ESG factors into their management processes. Currently, most SMEs do not seem fully environmentally friendly, and the implementation of green operations is still not adequately widespread. Moreover, SMEs approach sustainability in a less structured and formalised manner than larger companies because they generally adopt more informal strategies, Finally, while the majority of European businesses report that they have been affected by climate change during 2022, only 36% of EU firms have taken action to address climate-change risks, with larger firms being more proactive and only 13% have bought insurance to protect against physical risks like extreme weather. In the different European countries, SMEs are transitioning to sustainability at different rates, with the greatest progress being made in Germany, followed by Italy, Portugal, Austria, Spain and France. (D'Apolito et al. 2024, 2)

While hard standards do not come into force internationally, soft law guides foster spontaneous human rights due diligence procedures. Increasingly supported by institutions such as the Thun Group (2013, p.3), United Nations Environment Programme Finance Initiative (UNEPFI), International Finance Corporation (IFC), etc., human rights due diligence implies details and complexities for its real effectiveness:

> Other sources may be other banks, development banks, export credit associations, legal advisors and customers who may be familiar with dealing with human rights issues. All these participants in financial markets could fruitfully assist each other in this endeavor by exchanging information and best practice. Secondly, from an internal perspective, it is useful to identify and build relationships with departments and managers (…) for: credit risk policy, transaction level risk assessment, project finance, investment banking client relationships, compliance, legal, public policy, corporate responsibility, internal and external communications, among others with similar goals. (Buckley, 2016, p. 426).

So, there is a clear convergence between the SRI objectives and the possible methodologies that implement human rights due diligence, but the financial activities complexity, their multiple agents in global network and difficulties harmonizing legal standards with sanctioning power reveal significant gaps to fulfil such policies. We will address some of them, but first, the very association of human rights with financial activities is felt by many as an operational obstacle (Dowell-Jones, 2013).

Whether financial institutions will be able to transcend the dimensions of mere financial risk analysis in this matters or not, beyond the cost-benefit of control measures tradeoffs, leaving behind "cosmetic" internal practices (Evans, 2016) to take real actions at the core of their businesses (Weber, 2016) is a challenge to keep in mind when researching these topics in the coming decades (Kaisershot & Prout, 2015), as the historical criticisms of the doctrine in this regard noisily indicate the failure of due diligence practices and human rights impact assessment (Mcinerney-Lankford, 2019; Dowell-Jones, 2013; Martin-Ortega & Hoekstra, 2019).

## 3. Social Responsible Investments for private investors

As inferred thus far, ESG finance consists of the capacity that financial institutions have to drive their policies and social responsibility towards credit takers, namely institutions, companies and governments with financed projects that may have potential negative impacts on human rights, and then decide if they apply their capital or not.

ESG finance would be gravely incomplete without the flow of financial activities of another nature, that of investors associated with different operations and norms. Socially Responsible Investment (SRI) got major importance in the international ESG finance agenda after the Principles for Responsible Investment (UNPRI) under the auspices of UNEPFI.

According to the official UNPRI website, the six SRI principles consist of:

> Principle 1: We will incorporate ESG issues into investment analysis and decision-making processes.

> Principle 2: We will be active owners and incorporate ESG issues into our ownership policies and practices.
> Principle 3: We will seek appropriate disclosure on ESG issues by the entities in which we invest.
> Principle 4: We will promote acceptance and implementation of the Principles within the investment industry.
> Principle 5: We will work together to enhance our effectiveness in implementing the Principles.
> Principle 6: We will each report on our activities and progress towards implementing the Principles. (UNPRI, n/d).

With an ongoing report strategy, the UNPRI stands that financial social responsibility requires commitment from the investors themselves, not just from the companies with which they have contractual relationships, involving sectors of civil society to ensure that ESG policies are being safely adopted and fulfilled. For example, this commitment made until 2024 requires:

> Providing evidence, tools, guidance, and examples of best practices in the evaluation of financial risks/opportunities and connections with real-world outcomes; Facilitating collaborative engagements on priority ESG issues;
>
> Increasing support for responsible investments in emerging markets;
> Fostering new reporting and evaluation processes, following models;
> Raising minimum requirements;
> Building trust in data reported to PRI by exploring stronger assurance measures; Enhancing training for investment professionals through the PRI Academy; Better connecting investors and academics. (UNEP/Global Compact, 2021)

There are already financial market assets designed so that investors can make their investment decisions with social responsibility. These include ESG funds, which are investment funds where the manager must evaluate not only financial assets performance but also performance of their issuers based on corporate governance, social, and environmental criteria before defining which one enters the portfolio. Another example is the “green bonds”, which are private debt securities issued by financial institutions or companies to raise funds for the financing of sustainable projects, i.e., those that have a positive environmental or climatic impact.

Although the Organization started a “delisting” strategy for institutions that failed to meet the minimum standards, the reported outcomes may not suggest many merit yet. The most recent findings revealed a pronounced geographic bias (71% European) and limited efficacy in assessment impacts or remediation objectives (8%), suggesting that further progress is necessary:

> Adoption of the UNGPs and the OECD Guidelines has increased most significantly among investment managers (increasing from 18% to 30% of signatories across two years). A larger percentage of asset owners continue to identify human rights outcomes using these frameworks. A total of 950 investment managers and 235 asset owners reported using these frameworks, representing USD$24 trillion and USD$10trn in assets under management (AUM) respectively.* Adoption of these frameworks remains largely a European phenomenon, with 71% of the signatories using these frameworks coming from this region.
> Approximately 11% of signatories reported enabling access to remedy, of which 8% provided access to remedy via engagement with investees, and around 3% provided access to remedy directly themselves. (UNPRI, 2024, 5)

Financial institutions and brokerage firms find strong incentives to create more products focused on ESG, as investor demand becomes high. Evidence of this is that, in July 2020, global ESG funds accumulated fundraising around USD 33,9 trillion were expected to 2026 all over the world (PWC, 2022), or in more recent reports, ESG assets are predicted to hit $40 trillion by 2030 (Bloomberg, 2024).

Naturally, not everything is smooth in the ESG investment sector. For some researchers, the so-called "broader social concerns" may actually represent just a new path to competitive advantages, brand projection, and profit generation. Several studies support this view, and the main idea is not new. According to Freeman (1984), CSR leads stakeholders involved in the company's activities to a greater sense of satisfaction, which supports the organization's reputation and, therefore, improves business performance. Maignan & Ralston (2002) and Baron (2008) already observed that tendency many years ago, suggesting that corporate social responsibility could be part of a company's differentiation strategy, leading to a higher perception of value and thus improving business performance. According to Peloza (2009), corporate social responsibility opens doors for greater customer loyalty, new market opportunities, and the development of new competencies, which, in turn, enables the improvement of business performance. Recent research confirms this trend (Baglayan et al, 2018)

A concrete example, as cited in the Bank and Investor Risk Policies on Soft Commodities report by the United Nations Environment Programme UNEP, is the case of FMO, a Dutch entrepreneurial development bank that invests in over eighty-five countries. According to the report, one of the measures taken by that financial institution was the inclusion of ESG clauses in contracts:

> FMO has a strong programme in place to implement and monitor compliance with its environmental and social policy. FMO’s investment approach involves assessing, implementing, and monitoring ESG practices within its clients’ operations. To do this, FMO conducts an ESG risk assessment against IFC Performance Standards and ESG risk categorization process prior to working with

> a client, includes ESG clauses in contracts, and develops ESG action plans. (UNEP, 2015: 48)

The main topic, therefore, is how to ensure that contracts between investors and companies are fulfilled, with special attention to the effectiveness of ESG policies, preserving the social responsibility of both sides. ESG clauses are not only a focus of study in corporate contractual law in general but also a constant and changing research agenda due to the dynamic nature of finance. Even in well-known and heavily regulated investment market operations, the fraction aimed by engaging with ESG principles and human rights still seems small to some lecturers:

> Similarly, ethical investing initiatives tend to target only a particular sector of the fund management business: mainstream asset managers and pension funds. Other vehicles, such as hedge funds, private equity, insurance and ETFs are largely, if not entirely, off the radar. (Dowell-Jones, 2013, p.443)

Moreover, investors operate in a world of international, multi-level, and highly quantifiable operations, but the perfect identification of criteria and methodologies dealing with quantitative values such as working conditions, community involvement, and the effects of microfinance, similar to what happens with financial institutions, is a constant challenge:

> The difficulty however is that no matter how genuine these commitments are, without a developed methodology or framework which would enable human rights commitments to be meaningfully applied across the complex operations of vast financial institutions, their practical operational impact is very limited. This is clearly evidenced by the details of the main functional areas in which these human rights commitments are applied by these banks: employee rights, including equality and diversity; financial services in areas where human rights issues are well known (for example, project finance, corruption/know your customer legislation); supply chains (for example, responsible sourcing of products); community engagement and involvement (for example, supporting charitable initiatives and affordable banking), and microfinance. (Dowell-Jones, 2013, p.454)

Not to mention the most absurd limiting situation of ESG finance, initially reported by John Ruggie himself in the case of business activities in general: when the law itself is used against the protection of human, environmental, and social rights through investments. It is not uncommon to claim that such ESG precautions generate costs and that managers' actions should adhere to the legal limits of their mandates, which strictly involve the interests of their shareholders for profit, as it is not uncommon for judicial courts to uphold this understanding (Dowell-Jones, 2013, p. 444).

This paper aims to update some issues in finance influenced by technological revolution in recent years, and also to outline some future possibilities regarding the

impacts of artificial intelligence and smart contracts on human rights, consequently aligning the sustainable development goals and ESG finance. On the main focus, It mentions the decentralizing credit and other products developed without a central regulation. Microcredit is the oldest and most original example and its digital face, understood by branches of DeFi and Fintech, a challenging phenomenon.

According to Zhang, "financial development, encompassing both FinTech and green finance, is characterized not only by digitalization but also by a significant trend towards sustainable transition through ESG integration" concluding that "FinTech can serve as a catalyst for sustainable growth, thereby mitigating the risk of insincere ESG practices". (Zhang, et at. 2024).

Last but absolutely not least, it's worth to mention that a core topic of the field would suggest a special chapter or further consideration, although remains out of this paper's range, which is "how FinTech influences greenwashing behaviors by revealing two plausible underlying mechanisms: the reduction of information asymmetry and the lowering of operating costs".

## 4. Microcredit and Decentralization as ESG Finance Agendas

In the last decade, financial transactions were impacted by digital environment and began to be exponentially driven by cutting-edge technologies. The access to products and services were transported by the internet. Although the global numbers are scarce, local research reveals that, for example, in the USA, 77 percent of consumers prefer to use on-line banking services through a mobile app (55%) or a computer (22%) while very few people still uses offline services, like a bank branch (8%), ATMs (5%) or telephone calls (4%) (ABA, 2024). The impact of COVID-19 on digital financial inclusion was also significant to accelerate the shift to on-line banking (World Bank, 2021. Deloitte, 2025).

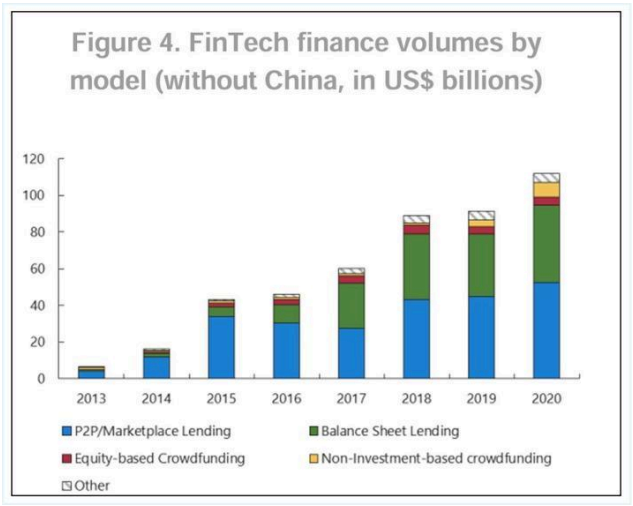
The current step is the crescent use of the so-called "disruptive digital technologies", with new infrastructures and financial tools for credit access and new roles of social and sustainable investments that may show significative impacts on human rights in general.

Currently, banks, financial institutions, and institutional investors are in a new "gold rush" around the Big Data universe. The technologies that enable new realities of socioeconomic interaction with public and private products and services include artificial intelligence (AI), cloud computing, decentralized blockchain operations, and the development of quantum hardware and processing capabilities (UN, 2019).

If the relationship between institutions, investors, and the contract chain in the analogical world already had transformative potential in people's reality, what happens when financing and investment become digital, automatic, quantum-like, and processed in the cloud by AI? The current state of this movement shows constant discussion in many fields globally considered (McKinsey, 2021).

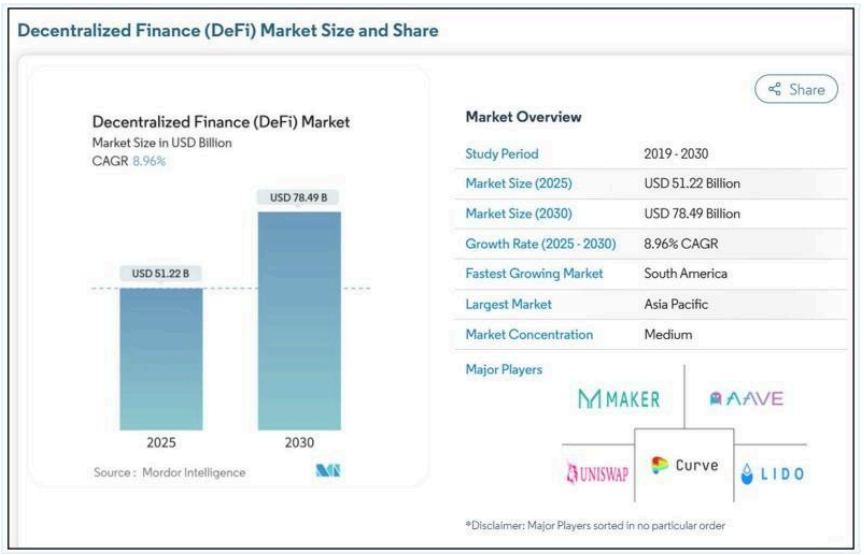
Among the potentially positive points are the numerous functionalities of fintech, especially the decentralization of consumer's loan market via digital platforms, which, in its most revolutionary face, allows the use of AI and blockchain for an expansion of relations between investors, creditors, and credit takers. Ultimately, this expansion can reach the touted disruptive effect in fundraising, credit, and financing completely decentralized (peer-to-peer), i.e., without the intermediation of formal credit and investment institutions or regulatory agencies.

The global P2P lending market was estimated in USD 190 billion in 2024 which is about an estimated 1% or 2% of total lending market share (GCFI, 2024). To track data about the actual P2P lending market share is considered very difficult due to its multiple formats and sources, sometimes including marketplaces platforms and crowdfunding, but its size is growing fast like the overall fintech volume is presented by Naceur et. al.:




(source: Naceur, B. et al. 2025, 10, Fig.4)

On the other hand, blockchain-based lending (DeFi) is perceived by market players also as an important segment of digital finance in recent years. Considering the available data of some of the main global DeFi platforms like Aave, Compound, MakerDAO, Uniswap Labs, Curve Finance, Lido Finance among many others, the current value may be around USD 138 billion (Defillama.com, 2025). Although it has been reported to be in a much lower volume of USD 50 billion by other sources, this segment of financing is expected to grow in the next years.




Source: (Mordor Intelligence Research & Advisory, 2025)

All those new mechanisms become now crucial to achieve ESG goals and to grant economic and social development, such as poverty reduction, following the aforementioned Addis Ababa Agenda for public and private finance for human development and financial inclusion, as microcredit designed for surrounding communities in some investments:

> Many people, especially women, still lack access to financial services, as well as financial literacy, which is a key for social inclusion. We will work towards full and equal access to formal financial services for all. We will adopt or review our financial inclusion strategies, in consultation with relevant stakeholders, and will consider including financial inclusion as a policy objective in financial regulation, in accordance with national priorities and legislation. We will encourage our commercial banking systems to serve all, including those who currently face barriers to access financial services and information. We will also support microfinance institutions, development banks, agricultural banks, mobile network operators, agent networks, cooperatives, postal banks and savings banks as appropriate. We encourage the use of innovative tools, including mobile banking payment platforms and digitalized payments (UN, 2015).

The main impacts of microcredit on human rights can be listed: individually, for those who receive or do not receive financial resources; collectively, for the people directly affected by how the resources are used; globally, on societies and surrounding communities indirectly affected by the funded projects. In any of these items, microcredit to individuals may have ESG and human rights impacts.

Strictly speaking, the democratization of credit as a social development policy is not new. A classic case is a program that helped women in vulnerable situations overcome inequality in Bangladesh. Based on the initiative of Muhammad Yunus, an economist and professor who started his microfinance project in 1977 with the Grameen Bank (Yunus,

2007), the case was acclaimed as a success, with its authors, especially Yunus, being awarded the Nobel Prize in Economics three decades later:

> Grameen Bank (…) served 4 million families and provided 4.5 billion US dollars to its borrowers across Bangladesh. The credit recovery rate is 99% [...]. It has not only had tremendous success in generating income to the bottom 50% disadvantaged women, but it has also empowered them to make choices, have a voice, and gain opportunities and bargaining power. (Rouf, 2012: 30)

Naturally, there are also positive impacts on the communities where those women belong. Historically, other projects preceded and followed Yunus's example with an interesting Brazilian microcredit experience like the Bangladeshi BRAC (1972), the Bolivian BancoSol (1992), the U.S. Kiva (2005), the Palmas Bank (1998) and the Arariboia currency in Brazil (data), the Equity Bank in Kenya (1984), which sparked interest for a new line of research on the institutional scenario of microcredit provision as a basis for other considerations involving the use of technologies. (Greatti, 2017; Borghi, 2019; Teixeira, 2020, 77; Barbosa, 2019; Malhotra, 1997; Quem se importa, 2011).

With the ongoing digital revolution, the question is how the use of AI and other technologies such as blockchain and smart contracts can influence sustainability indicators for good or bad. The various forms of artificial intelligence are under discussion in the UN's SDG 2030 forums (Vinuesa, et al. 2020). According to Sherman Lee, the decentralization of financing enables access to credit without banks. Recently, this trend has been driven by blockchain technology, with benefits in security and transparency to individuals and legal entities who aim to get credit anywhere in the world:

> Borrowers then simply put in a single request which links them up with potential lenders and a clear overview of the different terms of each lender. For lenders, the use of smart contracts allows for much easier assessments of the counter-party's trustworthiness. Something that would take traditional audits weeks, not to mention the costs of such a traditional audit. Validating transactions and follow-up can become fully automated. (LEE, 2018, n/p).

In a brief analysis, it is seen that this fintech function can (1) democratize access to credit and materialize microcredit; (2) enable access to larger credit volumes; and (3) facilitate the meeting of creditors and debtors with more compatible profiles. In more recent cases, it was noted an increase in digital disruptive infrastructures (cloud, quantum, AI, blockchain etc.), spreading creditors in consortiums or syndicated loans (Allison, 2021). However, an explosion of credit via digital platforms carries many risks and can also bring unprecedented negative impacts on human rights in general, as will be addressed later.

## 5. The Use of Blockchain and Smart Contracts in ESG Finance

Smart contracts are a concept that existed even before the emergence of blockchain technology. The automation of contractual terms in the "If A/then B" format has its origins in early vending machines and public telephones. The second step came with the information era, where the computer programming of the "If A/then B" function expanded with the recording of commands in software. This phase brought a second-generation smart contract common in the control of production and logistics chains. In these primitive formats, any person or company could create an intelligent contract by translating its terms into a digital programming code, but this use was quite limited and private, without guarantees against arbitrary post-facto modifications.

The third generation of this movement came with blockchain technologies, using DLT (Chancellor et.al, 2021) and a whole new infrastructure because it was based on selfprogramming and decentralized systems. As the origins of smart contracts are linked to the use of blockchain techniques in the Ethereum cryptocurrency, this technology made contract codes much more complex than the original "If A / then B" models, as well as making them more practical and secure. A fourth phase is already underway with the multiplication of blockchain technologies, whether in public or private networks, with sophisticated codes frequently designed for specific market and product demands. (Abijaude et al., 2021. pp.2-3).

But after all, are they really contracts? According to McKinney, Landy, and Wilka, smart contracts can be defined as "self-enforcing agreements that exchange promises or consideration between parties based on a transparent set of rules using predefined inputs" (MCKINNEY et al, 2018). The authors argue that, although smart contracts are often associated with AI, which supposes intelligence to make them more flexible and adaptable, this is not the case, as they are created to be inflexible because the self-execution of the contract depends on a code recorded on the blockchain network in an unalterable way. However, there are technologies for their alteration and revision with the application of AI (Omohundro, 2014, P.19; Sharma, 2021; Abijaude et. Al. 2021)

Although this notion as a “contract” is initially an operational and not a legal concept, while the blockchain network expands and new forms of socio-economic interaction are digitalized, their special legal implications achieve greater complexity, such as pure or mixed types of smart contracts, increasingly capable of translating complex legal contractual issues into programming code. When mediated by applications, platforms, and cell phones, and with the growing use of artificial intelligence, it is evident that the regulatory legal field of what would be smart legal contracts and their problems of interpretation, execution, suspension, etc., is already a current reality (Yang et. al. 2019; Sánchez, 2020; Chancellor et. al. 2021).

The examples of blockchain and smart contract implementation in finance are growing:

> In 2015, Santander implemented a trial version of a Blockchain-based app that can allows transfer from £10–10,000 in Euros to 21 countries, and in USD to the US. In Mexico, mexBT launched a Blockchain platform for remittances between LatAm and Asia, the system allows transfers in both BTC and fiat currencies. (...) Also, Blockchain can empower NGOs' and other type of donors. Notably, it can make sure that funds reach their intended beneficiaries and are spent in a proper way, For example, Bankymoon – a South African bitcoin startupallows African public school to crowdfund their utility expenses by employing smart meters and Blockchain technologies to connect donors directly to the schools. (Benavides, 2019: 44, 47)

Then blockchain resources become seductive under other postulates. According to recent research, a blockchain contract does not eliminate the need for risk assessment using data provided by government institutions and relies on official regulatory assurances to enhance the system, but the cooperation between the distributed network and relevant authorities is expected to improve contract automation (Yang et al., 2019). This use of blockchain can increase transparency between individuals, companies, and platforms, and the embedded smart contract can be tracked and executed always in verification of information, the location of the transaction, giving asset code features that can facilitate intelligent legal regulation.

> The combination of blockchain and smart contract technology enables smart contracts on the blockchain to directly control the characteristics of borrowing funds and their transfer, ensuring the reliability, authenticity and compulsory of the lending system, providing strong evidence for trading and improving the credibility of the system itself. (Yang et al., 2019, p.6)

Once the fundamental concepts and applications of blockchain, smart contracts and AI are understood, the business and human rights agenda is an open field. In terms of finance as an economic sector, in principle, the old problems related to decent work and employment, safe environment and communities, identities and civil rights in general must be completely readdressed not only in the Fintech branch (Galeone, 2024). And the energy consumption of blockchain network processes is still a huge obstacle to overcome.

Being the focus of this work on the specific technologies risks, especially AI and ESG finance, the expanding technological branch that fits into the Fintech phenomenon is at stake. Reports on "Finance 4.0" are concerned with ethical aspects of AI and are well summarized by the World Economic Forum in three lines of consideration: labor displacement; bias and discrimination; systemic risk (WEF, 2018, p.81).

Considering only the ethical concerns with discriminatory bias, many cases of discrimination have already been reported in the fintech field, such as the Tala App case, which started using AI with risky criteria for defining and classifying credit profiles:

> For example, the 'Tala' app (formerly Mkopo Rahisi) uses mobile data to create a financial identity to borrowers in emerging countries such as Africa and Asia. Financial identity is established through data such as a borrower's stability in key relationships; connections; network diversity; location consistency; financial transactions. According to the founder Shivani Siroya, a borrower with at least 58 contacts is more likely to repay his/her loan. Tala's repayment rate of 90% is impressive. These are all encouraging news but non-traditional data attracts the problems of data reliability and privacy. If machine learning algorithms programmed that the average credit score of a 'friend' on social media platforms is used as a predictor of creditworthiness, how can they tell whether the friendship is genuine or not? (…) Systemic bias might arise if the machine-learning algorithms are programmed to the effect that financially responsible consumers are likely to socialize with financially responsible people. (Lui & Lamb, 2018, p.14)

According to Boukherouaa, there are opacity problems inherent in the very nature of the "black boxes" of AI programming used in general, including finance, by definition averse to inspection for several reasons, as "(1) they are complex and cannot be easily interpreted; (2) their inputs may not be known; (3) they are a set of models rather than a single independent model; (...4) a better explanation may allow outsiders to manipulate the algorithm and create risks in the financial system" (Boukherouaa et al., 2021, n/p).

Similarly, Liu & Lamb point out that this opacity of AI systems is even more complex and profound while characterized as diffuse, opaque, with discrete infrastructure and reserved coordination:

> Scherer's scholarly work on AI regulation argues that ex ante regulation would be difficult because AI research and development may be "discreet, discrete, diffuse and opaque". It is "discreet" because there is not much physical infrastructure in place yet; "discrete" because of the complexity of AI systems that unconscious co-ordination takes place; "diffuse" due to the number of people involved and geographical diversity, and "opaque" due to complexity of machine learning algorithms. (Lui & Lamb, 2018, p.14)

If the international community includes regulatory concerns with fintech developing AI, and at the same time, financial and investment institutions seek to take action in the ESG agenda, new disruptive realities present challenges not only because they tend to dissolve hierarchies based on legal regulation based on national borders and central authorities but also because they impose new hierarchies that do not favor ethics and human rights specialists but those who speak the language of programming codes:

> Rather than the "flat world" of Tom Friedman's dreams, automated finance just introduces new hierarchies: among cryptocurrencies; within any particular one, among high level coders and those who just do what they are told; and, of course, between the coder class and ordinary users. (Pasquale, 2021, p. 124)

Another problem identified in recent studies points out that not all fintech tends to favor broad access to finance and open blockchain networks. According to Pasquale's analysis, reproductive or incremental fintechs are backed by the traditional financial system and are not necessarily inclusive. From a strictly financial and competitive market perspective, they have shown concern with inclusion, but a "predatory and scary" inclusion aimed at "submitting people to situations of economic disadvantage":

> Without proper guardrails, there will be a race to the bottom in both sharing and behavior shaping, as more individuals compete for better deals. That would result in a boom in predatory inclusion (which harms more than it helps), creepy inclusion (which gives corporate entities a voyeuristically intimate look at our lives), and subordinating inclusion (which entrenches inequality by forcing people to maintain the same patterns of life that resulted in their desperation in the first place). (...) They allow persons to compete for advantage in financial markets in ways that undermine their financial health, dignity, and political power. (Pasquale, 2021, pp. 121/122).

On the other hand, fintechs born with the disruptive potential of blockchain would have different potential for inclusion and democratization of credit as much of their origins are ideologically opposed to the historical practices of capitalism of co-opting state institutions. Still, in Pasquale's analysis, based on the cryptocurrency Bitcoin as reference, blockchain technologies would need to detach from "anarcho-capitalist" and "cyber-libertarian" ideologies, with the ever-present risk of being fueled by far-right ideologies and, at the other extreme, would need to get rid of the opacity associated with more common deep web crime, averse to regulation not for libertarian but criminological reasons.

Although this lack of ethical control and mastery, the doctrine already identifies some immediate action guidelines at least for the problem of bias and discrimination in the use of AI, assuming that, as the level of information and programming of machine learning (ML) develops with worldwide collective plans, these problems can be circumvented by the machines themselves.

> Such plans could include adequate assurances about the algorithm's robustness against systemically generating biased decisions, disclosure of data sources, awareness of potential bias-generating factors in the data, monitoring and evaluation tools, and, more generally, how the institution intends to meet the standing anti-discrimination rules in the context of AI/ML deployment. (Boukherouaa et al., 2021, n/p)

Therefore, ESG finance practices for banks, investors, and fintechs must constantly improve criteria that identify AI risks to their declared ESG objectives. Regarding the most important disruptive potential for the use of AI, blockchain, and smart contracts in the practices of decentralization and democratization of finance, it is necessary to ensure

equality and equity in access and transparency of processes to allow ethical choices of the big investor or the small one, or even the consumer who uses fintech platforms.

The complexity and potential of these technologies, if correctly directed by corporate integrity purposes, can generate unprecedented improvements both in verification and auditing forms and in the material objectives of financial social inclusion:

> Based on the same architecture of supply chain solutions, public Blockchains with identified parties can eradicate bribes, fraud, and funds deviation from public entities. For MFIs, fully disclosed ledgers, end-to-end from donors to beneficiaries, could be a milestone that ensures that funds are allocated properly, without any abuse to the stakeholders, or the existence of funds with "unethical" origins or endings in the financial supply chain. Blockchain can also be used to create "Qualified money", which are funds specifically programmed to serve certain functions or to be executed under certain circumstances via smartcontracts (…). BTs can also enhance internal and external auditing. Auditors can perform real-time inspections of data and the registries can be examined on daily basis instead of yearly, which ultimately reduce corruption and fraud. (Benavides, 2019, p. 47)

Finally, it should always keep in mind the political, geopolitical, economic, and legal issues of the blockchain-smart contract phenomenon with AI and other disruptions in facing the ethical dimensions that such topics entail. The fact that a good part of the corporate ESG ethical debate, including academia, is constantly accused of co-optation by economic interests emanating from the main technology production centers today, may blur the state of the art.

> There is now an enormous amount of work under the rubric of "AI ethics." To be fair, some of the research is useful and nuanced, especially in the humanities and social sciences. But the majority of well-funded work on "ethical AI" is aligned with the tech lobby's agenda: to voluntarily or moderately adjust, rather than legally restrict, the deployment of controversial technologies. How did five corporations, using only a small fraction of their budgets, manage to influence and frame so much academic activity, in so many disciplines, so quickly? (Ochigame, 2020, n/d)

## 6. Conclusions

The ESG objectives for financial institutions and investors are a current political and legal reality, present in numerous soft regulations such as the Addis Ababa Agenda, the Equator Principles, and the Principles for Responsible Investment (UNPRI), for example. The already consolidated concept of ESG finance, however, may fall into the utilitarian use of "broader social concerns" as just another path to competitive advantages, good brand image, and more profits.

In practice, for many, ESG finance with a more central view of human rights protection seems represented by a still small fraction of activities and services, still tied to

a quantifiable world, with lacking criteria and methodologies dealing with qualitative values of human development and corresponding rights.

When the numerous fintech functionalities come into play, especially the decentralization of the market via blockchain and smart contracts, the next step is the complete renewal of the concept of ESG finance and SRI in those environments. Smart contracts are one of its promises in combination with AI and decentralization in the DLT infrastructure of blockchain networks.

If the use of blockchain can increase transparency, security, and access to investment among numerous promises that favor the democratization of finance in an unprecedented way, on the other hand, the inherent risks of these technologies are on the UN SDG's map. Issues like opacity, AI's discriminatory biases, hierarchy conflicts, predatory inclusion, and political and geopolitical problems with "anarcho-capitalist" and "cyberlibertarian" ideologies are at stake, not to mention the dark side of deep web crime, favored by blockchain. Ensuring equality and equity in access and process transparency to enable ethical choices by agents and a real impact on human rights is an ethical goal always sensitive to political, geopolitical, and economic pressures.

Whether the financial system will be led to choose ESG investments or include SRI clauses in their contracts may be less due to moral or legal obligation and more due to a real transformation of "public-private governance," associated with human results superior to profit. This transformation depends not only on disruptive infrastructures but on a true shift in the global economic system, a "Great Reset" towards a green, circular, and radically sustainable and human economy may be the path for the vertical improvement of ESG/SRI in all activities by companies, states, and civil society.

The conclusion points out that disruptive technologies (artificial intelligence, blockchain, and smart contracts) present a paradoxical potential for ESG finance. On one hand, they can democratize access to credit and improve transparency in responsible investments; on the other, they carry significant risks of algorithmic discrimination and human rights violations. Recent studies show that despite exponential growth in the digital finance market (from 35% in 2015 to 78% projected in 2024), the effectiveness of ESG practices remains limited in some fields, with only 8% of UN Principles for Responsible Investment signatories providing access to remedy, for example. Hard law regulation remains scarce, with voluntary guidelines (soft law) prevailing with no guarantee and coherent measures to a comprehensive human rights protection system.

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