

# *FinTech in Promoting the Development of Green Finance in China against the Background of Big Data and Artificial Intelligence*

Xin Yang

Business School

Nanfeng College of Sun Yat-sen University  
Guangzhou, Guangdong Province, 510970, China

**Abstract**—Green finance as a financial strategy can guarantee the sustainable development of the economy and ecological environment, it has been widely implemented within China and worldwide. Meanwhile, FinTech based on big data and artificial intelligence technology has been largely utilized in various fields since its emergence. In light of various issues in the development of green finance, the advantages of FinTech can be employed to offer solutions to deal with. The author concludes that FinTech can facilitate the development of green finance in the perspectives of decreasing bank credit risk, enhancing the regulation level, stimulating product innovation and the perfection of the information-sharing mechanism.

**Keywords**—*FinTech; Green Finance; Big Data; Artificial Intelligence*

## I. INTRODUCTION

As distinguished from traditional finance, Green Finance is also referenced as Environmental Finance or Sustainable Finance, which integrates environmental protection with economic profits [1]. In 2016, PBOC defined it as financial services that provide economic activities that improve the environment, tackle climate change, save and effectively utilize resources. In recent years, China has been actively investing and financing in the environmental protection field to contribute to the ecological improvement, such as promoting carbon emissions permit trading, leveraging social capital through issuing green bonds, green insurance, and climate funds. Most strikingly, China has been ranked second in the world in terms of the green bond issuance in 2018, with the total amount of 309 US dollars, accounting for nearly 20% of the global green bond issuance [2]. Notwithstanding, in 2018, the aggregate fund demand for green finance in China was 2.1 trillion Yuan, the aggregate supply was only 1.3 trillion yuan, results in a gap of 800 billion. In 2019, the total demand for green financial funds was up to 2.5 trillion yuan, and thus how to close the funding gap is an urgent issue to be addressed.

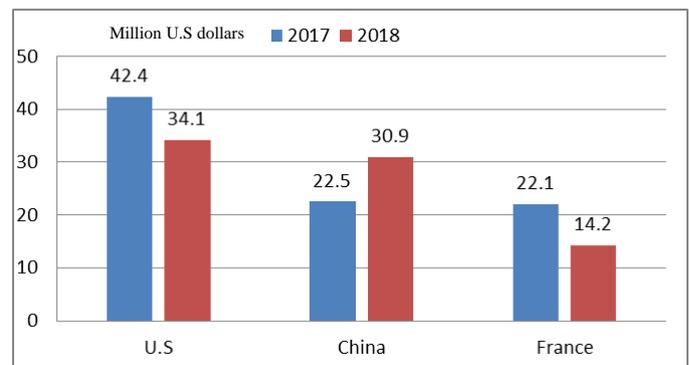


Fig. 1. Top 3 Countries in Issuing Green Bond in the World

Source: Climate Bonds Initiative; CBI

FinTech in China, on the other hand, is also developed rapidly after the 2008 global financial crisis, and there are three Chinese FinTech enterprises in the world's top ten FinTech companies. FinTech improves the innovation of financial products and efficiency of financial services based on mobile internet, artificial intelligence, big data, cloud computing and blockchain technologies. As several advantages of FinTech, such as finance Tech make deploying project finance capital faster, big data tools make building management more effective, tracking technology allows solar technologies to generate more production, etc[3], FinTech has applied in varieties of green finance and sustainable development scenarios in the European countries (Fig. 2)[4]. Nevertheless, FinTech in China only involves very limited areas in green finance, which are merely certain preliminary attempts. If green finance can further integrate with FinTech, the green finance funding gap would be relieved to a certain extent in China.

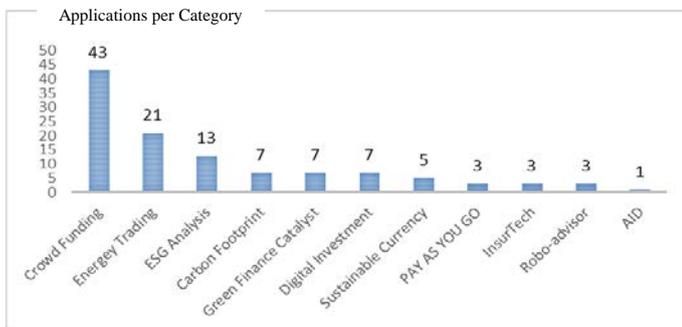


Fig. 2. FinTech Application in Green Finance Scenario of European Countries

Source: Sustainable Finance and FinTech in Europe

Therefore, this research aims at demonstrating the feasibility of applying FinTech in the green finance field in hopes of breaking through the bottleneck of green finance development in China.

## II. THE DRIVING FACTORS OF GREEN FINANCE DEVELOPMENT

### A. Government

The rapid growth of the Chinese economy in the past decades is obvious to all. Nevertheless, the significant impact on environment and resources, such as air pollution, soil pollution and waste pollution, etc, brought by the economic development is in contradiction with the residents' pursuit of a better life. And meanwhile, by realizing this has formed an obstacle to sustainable development in China, the government has introduced the financial resources and public policy measures to promote sustainability. In March 2016, the outline of China's 13th Five-Year Plan proposed the establishment of a green financial system, the development of green credit and green bonds, and set up green development funds. This is due to China's fiscal constraints, more than 85% of the green finance will have to come directly from the private sector to accomplish the goal to peak the carbon emission by 2030[5].

### B. Financial Institutions

For banks, green finance is a financial product and service that consider environmental factors throughout the loan decision, post-monitoring and risk management. Banks can bring into full play their expertise and support for environmental protection through financial products, and thereby achieving an effective combination of bank operations and social responsibility. As an example, Industrial Bank was the first commercial bank in China to fully embrace sustainable development and green finance, as it joined the Equator Principles in 2008 to practice its social responsibility. Fig. 3 displays the Industrial Bank's green business of 2018[6].



Fig. 3. Green Financing Portfolio and Amount of Corporate Clients

Source: Industrial Bank Annual Green Bond Report

On the other hand, green finance can also be used as a tool to help financial institutions improve their capital allocation and improve their portfolios' exposure to environmental risks since environmental and social risk management is also the management of credit risk and reputation risk.

### C. Enterprises

Enterprises in the green field, such as the environmental protection sector, new energy sector, and industrial energy-saving sectors, etc., cannot develop healthily without funding support. Although there are an increasing number of capital sources for green companies in China, they are still facing the challenge of insufficient available fund and lack of financing channels. The reason is most of the green enterprises are highly risky, due to the immature techniques, and heavy investment in their initial stage. This reflects the contradiction between financing problems and green economic growth. Therefore, more green finance supports, green credit, green bonds, for instance, should be provided to firms in these sectors to make them obtain adequate funding. The green industry can thus develop steadily and healthily.

Besides, enterprises are no longer only seeking transparency in their financial statements, and that a growing number of them believe green environmental protection is beneficial to human life. A great many Chinese enterprises actively engage in environmental protection business and disclose their ESG (Environmental, Social and Governance) information to the public. Green projects of these companies also need to be supported by green finance.

### D. Environmental Protection Awareness of Publics and Investors

There are many cities in China are updating PM2.5 index every hour. China thus has become the country with the most complete haze data in the world. Such abundant information allows people to pay close attention to the environmental issues around them, specifically, green finance which can be conducive to improve the environment.

The disclosure of ESG, including the assessment and response measures of the enterprise's own environmental risk, has become an essential tool for investors to identify and reduce the risk, and the long-term investment value driver [7]. Based on the measure of ESG, investors can observe the ESG performance of enterprises; evaluate their investment behavior and investment projects' contribution in promoting sustainable economic development and fulfilling social responsibility. To illustrate, investors can permanently increase or decrease the valuation model variables, the valuation ratio multiplier, expected financial ratio and portfolio weight, etc, according to the ESG analysis / ESG score. From the investigation results of CFA institute, Fig. 6 demonstrates how the investor incorporates ESG into their investments decision [8]. Therefore, it can be seen that disclosing ESG impels enterprises to continuously invest in more environmental protection projects, and therefore more green finance capital needs to be acquired.

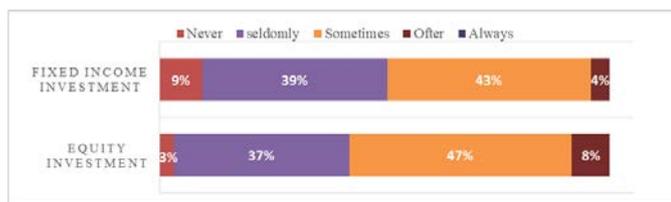


Fig. 4. How often do the Portfolio Managers and Financial Analysts Adjust Evaluation Model/Tool Based on ESG

Source: The Integrating ESG in China: Practice Guide and Case Research

### III. THE APPLICATION SCENARIOS OF FINTECH IN PROMOTING THE DEVELOPMENT OF GREEN FINANCE

#### A. FinTech Platform.

Platforms take technology as their service, which supports the innovation and product development of many institutions. They improve the efficiency of serving customers and the whole society. One successful Green Finance Platform has been developed by Huzhou Bank in China. It integrates technology elements into their green credit business process and management, such as Big Data, Artificial Intelligence, and Cloud technologies are employed in the platform. It is thus able to guide the green credit operation, identify and classify green projects, evaluate the environmental social benefit and provide early warning for the environmental risk, which are all completed automatically. Specifically, 'fake green', 'dyed green' projects caused by information asymmetry can be screened out by relying on the green big data facility, and thus the precious capital can efficiently play their role in protecting our environment.

Another possible platform is 'micro green bond' issuance platform. Most of the green bond issuers are large enterprises, yet small and micro businesses are difficult to obtain funds by issuing green bonds as their size of issuance is too small. The current attempt to solve this issue is through SEMs' joint bond, but with higher coordinate cost and moral hazard among joint members. Therefore, the better way to solve this is by employing digital technology to establish the internet-finance platform to enable SMEs to issue 'micro green bond'.

#### B. Green Insurance

The main functions of green insurance are to internalize the cost of environmental risk, solve the deterioration problem of environmental carrying capacity and ecological protection, reduce the economic shock caused by natural disasters. Nevertheless, due to the increasingly complex requirement of environmental risk management and stress testing for modeling, analyzing and forecasting, green insurance as itself is difficult to function well in China, as the scale of the Chinese green insurance market is comparatively small, and the insurance products are relatively simple.

Artificial Intelligence and Big Data technology can build environmental risk and price insurance intelligently. FinTech can assist financial institutions to adjust factors in the risk evaluation model, update the model index, and dynamically and quantitatively analyze environmental risk. Green insurance is thereby priced more scientifically, expanded the insurance coverage, and external environmental cost could be transferred to be internal.

#### C. Screening Green Project through Blockchain

Varieties of issues in green finance can be solved by the blockchain's advantages, such as decentralization, de-trusting, asymmetric encryption, Tamper Proof and traceability, etc. One of the most prominent characters of blockchain is the distributed shared ledger, which provides the opportunity for increased transparency in green finance and investments [9]. The consensus agreement can guarantee the authenticity of the information; asymmetric encryption can ensure the security of information; and many nodes communicate peer-to-peer in the decentralized scene, which can speed up the collection and exchange of information. Therefore, blockchain can be employed to cope with the asymmetric issue in pre-loan review and post-loan management.

Concretely, a green finance Consortium Blockchain that includes financial institutions, enterprises and environmental protection departments can be established. It publishes green projects operating conditions, cash flow and information disclosures to guarantee green fund can be invested in the real green project while screened out 'fake green', 'dyed green' projects. Afterward, regulation nodes would be set up, and the characters of traceability and Tamper Proof can be harnessed to track and monitor the information of the project reviewing, loan approving and the loan utilizing in real-time. Therefore, the green loan contract can be terminated and accountability would be traced once the default happens.

#### D. Ecological Sustainable Development

In 2016, Alipay has integrated FinTech to launch the personal carbon account-- 'Ant Forest' to stimulate users' low-carbon environment protection behavior. Saved carbon emission by online payment would be calculated as virtual 'green energy'. Once virtual 'green energy' is accumulated enough to grow the virtual tree, these virtual trees will be converted into real trees, and planted in the desert by people supported by Ant Financial and its partners. At the end of May 2018, there are 350 million participants, and 55.52 million real trees have been planted or preserved.

Another feasible scenario is artificial intelligence and big data integrated digital agricultural system. There is a representative system in Kenya, an automated drip irrigation system, which incorporates solar-powered sensors and big data analytics [10]. Sensors on or under the ground are connected to the IoT to collect data. And then the data will be uploaded to the AI and big data analytic platform in real-time to provide advice, which is, in turn, transmit to the IoT connected equipment to operate (e.g. dripping) automatically and precisely. The increasing productivity and lowering the water use level corresponds to the SDG12 that minimize the trade-offs between environmental and social sustainability. Furthermore, the crop monitoring data collected from the sensors can also be sent to financial institutions to relieve the asymmetry issues and the supply of credit and insurance products will consequently be augmented.

Some American institutions are exploiting to draw the carbon sink map of global natural resources by utilizing machine learning technique and satellite data, which enable them to acquire the instant information of natural resources evolution at a lower cost. To draw the carbon sink map, those satellite data combines with the LiDar data of Peruvian forest collected by the Carnegie Institute to identify the spatial structure of the forest and other landforms through machine learning. Once this algorithm is mature, this low-cost method can be extensively used to obtain carbon sink information of global natural resources.

#### IV. CONCLUSION

At present, although China has made remarkable achievements in the field of green finance, problems of small coverage scope, low participant rate of financial institutions, 'fake green' phenomenon still exist, the 'green' and 'finance' paradox remains to be solved. The driver of institutions to take part in green finance is the government policy rather than a market economy, which is adverse to the development of green finance. As FinTech has displayed extraordinary potential in the finance sector, harness the big data and artificial intelligence technology of FinTech to promote green finance can address a series issues of low enthusiasm in participation, low efficiency, high trading cost, lack of information communication mechanism, and difficult to regulate, etc. With the development and deepening research of FinTech, it will be

certain to further consummate the green finance system of China shortly.

#### ACKNOWLEDGMENTS

This work was supported by the Innovative Young Talents Program of Guangdong Province, China (Grant No. 2018WQNCX285)

#### REFERENCES

- [1] Y. Wang, and Q. Zhi, "The Role of Green Finance in Environmental Protection: Two Aspects of Market Mechanism and Policies," *Energy Procedia*. Volume 104, December 2016 Pages 311-316
- [2] Climate Bonds Initiatives. "Green Bonds: The State of the Market 2018," [https://www.climatebonds.net/files/reports/cbi\\_gbm\\_final\\_032019\\_web.pdf](https://www.climatebonds.net/files/reports/cbi_gbm_final_032019_web.pdf)
- [3] J. Shah. "Why VCs Won't Get the Rewards for Breakthrough Clean Energy Technology," *Unreasonable*, 2016 July 29 <https://unreasonable.is/vcs-wont-get-rewards-breakthrough-clean-energy-technology/>.
- [4] Financial Centres for Sustainability. "Sustainable Finance and FinTech in Europe," 2018 <https://static1.squarespace.com/static/59b29215c027d84ada066d3b/t/5c98bf62ee6eb05e1def3212/1553514351506/Sustainable+Finance+and+Fin+tech+in+Europe.pdf>
- [5] X. Zhang, M. Aranguiz, D. Xu, X. Zhang, and X. Xu, "Transforming Climate Finance and Green Investment with Blockchains," *Academic Press*, 2018, pp. 289-301
- [6] Industrial Bank. "Industrial Bank Annual Green Bond Report," 2018 [https://download.cib.com.cn/netbank/download/cn/notice/20190513\\_cn\\_1.pdf](https://download.cib.com.cn/netbank/download/cn/notice/20190513_cn_1.pdf)
- [7] S. Hafner, A. Jones, A.A. Kraavi, and A. Pohl, "Closing the green finance gap – A systems perspective. *Environmental Innovation and Societal Transitions*," Volume 34, March 2020, pp. 26-60
- [8] CFA Institute. "The Integrating ESG in China: Practice Guide and Case Research," 2019 <https://www.cfainstitute.org/-/media/documents/survey/esg-integration-china-1107-2019.ashx>
- [9] F.T. Hesary, and N. Yoshino, "The way to induce private participation in green finance and investment," *Finance Research Letters*, Volume 31, December 2019, pp. 98-103
- [10] J.B. Drasch, A. Schweizer, and N. Urbach, "Transforming agribusiness in developing countries: SDGs and the role of FinTech," *Current Opinion in Environmental Sustainability*. Volume 41, December 2019, pp. 1-9