

## Research on the Development Status of Green Finance-Based on Interregional Comparison

Xincheng Wang

Economics major, Franklin & Marshall College, Lancaster, PA, 17603

**Keywords:** Green Finance, Green Bond, Green Economy

**Abstract:** Green finance was first brought forward in late 20th century and have been developing till nowadays. It is a crucial part of green economy, and contributes significantly to the environmental protection industry, such as promoting the investment and financing activities that can lower greenhouse gas emission. This paper serves as a brief introduction to green finance and contains three parts. In the first part, the definition and the discrepancy between green finance and other types of finance, namely sustainable, environmental, and climate finance, is presented. In the second part, the chronological development of green finance is mapped out concisely. In the last part, some case studies and recent developing situation of a product of green finance, namely green bond, is displayed.

### 1. Introduction

Environment and economy, two drastically different fields, are indeed closely interconnected with our lives. When we talk about economy, we intuitively do not link it with environment, but we think about market instead. Yet, almost all the resources for any kind of production inevitably come from the nature. Overexploiting the nature results in devastating environment, eventually negatively impact the production. During industrial revolution period, London in Britain is known as The Smoke, a nickname reflecting the heavy smog in London due to heavy industry. Hundreds and thousands of people were killed by lung disease, a reduction in labor lowering the production that ultimately caused negative impact on economy. This is just one of the many examples. From industrial revolution period, people started to pay attention to the environment and have gradually dedicated more effort in protecting environment. However, without any feasible profit to support this enterprise of environmental protection, it is very formidable to proceed such undertaking in the long run. Thus, we are back to economy. The combination economy and environment, which then is called green economy, is the backbone for this career. In this interdisciplinary of green economy, green finance is one that plays a critical role.

### 2. Definition of Green Finance

Green finance begins with practice first and grows into a theory system gradually. Thus, nowadays the definition, theory system, and impact mechanism of green finance are still in the stage of developing and have not yet reach a unity worldwide. However, developed countries, due to the advance in industrialization progress, are one step ahead in the management and regulation of environmental pollution, and therefore the theory and practice of green finance in those regions are more nourished.

Early in the late 20th century, Salazar (1998) claimed that green finance was a financial innovation in approaching environmental protection, the bridge of financial and environmental industries. Cowan (1999) avows that green finance is the interdisciplinary of green economy and finance, focusing on the finance of green economy.

As the development of finance industry progresses along with environmental protection, those participating official organization of pioneer countries in the field have been polishing the definition and system of green finance since 2010. In 2012, International Development Finance Club (IDFC) regarded green finance in a border point of view, claiming that green finance is project sponsor and

environmental protection product of sustainable development of financial investment flow and policy to encourage developing sustainable economy. Green finance includes but is not limited to climate finance, thus also referring more alternative environmental objectives, such as Industrial pollution control, water sanitation or biodiversity conservation. British parliament 'special hearings on green finance' (2013) placed the foothold of the definition of green finance on investment, asserting that green finance is the investment for developing low carbon energy, improving energy efficiency, and adapting to climate change as well as the investment in the territories of environmental protection and natural resources. German Development Institute (2016) professed that green finance includes all investment or payment concerning environmental impact and augment environmental sustainability enhancement. G20 green finance research group (2016) maintained that green finance is investment and financing activities that can generate environmental benefits to support sustainable development, including reducing the pollution of air, water, and soil, lowering green house gas emissions, improving resource utilization efficiency, mitigating and adapting to climate change and reflecting its synergistic effects, and so on.

Here is one interpretation in detail offered by "Green China's Financial System" Study Group of DRC (2016). The definition of green finance can be divided into two sense, a narrow sense and a broad sense. The focuses of the two vary significantly. The focus of the narrow sense is to identify what percentage of specific financial assets is green. Some of the standard for the narrow sense are procedural (measuring and calculating the management of environment, society, and governance), and some are industry standard (renewable energy, recycling, waste management and environmental protection) that is predefined prioritizing in supporting green industry (or technology). The pivot of the narrow sense definition focuses on evaluating environmental condition, and identifying key industries and technology for supporting green finance.

The broad sense definition of green finance aims at determining the general objectives in sustainability of financial system and at proposing methods to measure its effectiveness. Set financing standards in basis of the objectives of financial system, and allocate capitals efficiently at environmental risks. The pivot of the broad sense definition focuses on the entire financial system and macroeconomic stability.

A vital divergence of the definition of green finance between developed countries and developing countries is that former pay great attention to climate, regarding future climate change and corresponding technological adjustment as the main risk factors of financial institution. For instance, Center of International Climate and Environmental Research-Oslo defines investment in fossil energy as non-green while assessing the issuance of green bonds. In contrast, developing countries, such as China, classify any investments that can lower the usage of fossil energy and unit energy consumption as green. One example is that high-speed rail bonds are considered green bonds in China, but developed countries deny such classification. Due to the completion of industrialization progress, having settled the common issue of environmental pollution in the early stage of industrialization, developed countries, when assessing the greenness of an investment, usually leave out its functions of pollution control and prevention, whereas in developing countries, like China, that type of investment is surely considered green.

Why is the definition of green finance critical? With an explicit definition, people have an accurate compass guide their paths. If the definition is too vague, people will encounter obstacles proceeding their progress in practice. As mentioned, green finance does not yet have a worldwide consolidated definition. In addition, some related terms of finance (sustainable finance, climate finance, and environmental finance) *prima facie* look familiar with green finance, and they, too, do not have their explicit definitions. Thus, we need to at least distinguish those terms and comprehend their differences.

The crucial point is to grasp the relationship of the terms green, sustainable, environmental, and climate finance. The four terms can be sorted into an inclusive relationship, tier 1 being the most inclusive, tier 4 being the most exclusive. Tier 1: sustainable finance; tier 2: green finance; tier 3: environmental finance; tier 4: climate finance. Climate finance mainly focuses on climate change adaptation and other climate change mitigation. It is the most limited one. Starting off with climate

finance, environmental finance includes waste processing and recycling, biodiversity protection, water sanitation, and industrial pollution control. Next, green finance targets renewable energies and energy efficiency in addition to the objectives of environmental finance. Finally, sustainable finance entails all the three finances above as environment-oriented subcategory, but it also holds other non-environment-oriented subcategory, such as sustainable corporate finance, which is targeting at how to run a firm sustainably instead of environment. However, when sustainable finance, green finance, environmental finance, and climate finance are used in any topic related to environment, their essences are the same, namely utilizing manifold financial tools to protect environment and biological diversity.

### **3. Chronological Development of Green Finance**

The development of green finance is mainly promoted by international financial institutions with governmental supports, stemmed from humanity's attention on environmental issue and pursuance of sustainable development. It can be basically divided into three stages: emerging stage, initial stage, and developing stage.

Emerging stage was from 60s to 80s in 20th century. The awareness of environmental protection and the concept of sustainable development were raised during the period. Prior to this period, from 30s to 60s, eight major pollution incidents took place and severely shocked the world. People started to pay attention to environment. In 1962, *Silent Spring* by Rachel Carson, an American writer and biologist, was published. The book demonstrates many environmental issues, such as abuse of DDT, in fables. At the moment, the concept of 'environmental protection' has not been brought up, so Carson's book was an enlightenment of people's awareness of environmental protection. In 1972, Roman Club published research report *Limits to Growth*, claiming that to prevent from exhausting environmental resources, economic growth rate should be zero. Thus, people began to consider environmental protection issues.

Then, commercial banks stepped into the play. Some international organizations and governmental departments started to worry about environmental problems. In 1972, The United Nations Conference on the human environment was convened, and approved United Nations declaration of the human environment, which raised 26 specific principles and 7 common views for global environment. In 1974, Germany established the first bank of environmental protection in the world, named Eco-bank, specializing in providing favorable loans to environmental projects, which were unwelcomed by regular banks. This Eco-bank can be considered as the primitive form of green finance. In December 1980, Comprehensive Environmental Response, Compensation, and Liability Act, or Superfund in short, has been promulgated and implemented. Superfund clarifies the responsibility of polluters and established liability trust fund and dangerous goods trust fund. It was the first time that financial institutions, environmental protection institutions, governments, enterprises and individuals all participate in regulating environment, thus providing rudiment for the development of green finance.

In 1987, World Commission on Environment and Development (WCED) published report *Our Common Future* in which the concept of sustainable development was first brought up, enlightening people's thought of alternating economic pattern and therefore starting green revolution. Sustainable development was defined as the development that meets the needs of contemporary people, but does not impair the ability of future generations to meet their own needs. The approval of the report during the 42nd General Assembly of the United Nations in 1987 become the pivotal point of the transformation of sustainable development from theory to practice.

Initial stage is from 90s in 20th century to the beginning of 21st century. Green finance sprang up in developed countries. International organization promoted the development of green finance. In 1992, United Nations Conference on Environment and Development (UNCED) passed Agenda 21, Rio Declaration, and Statement of Principles on Forests in Rio de Janeiro. Agenda 21 provided a comprehensive blueprint for sustainable development for development agencies, UN organizations, governments, non-governmental organizations and independent groups, including environmental protection, resource utilization, economic sustainable development, and social

sustainable development. In 1998, World Bank developed Handbook on Pollution Prevention and Elimination, an improvement of environmental assessment procedure. In 2002, the conference of international well-known commercial banks was held in London. The International Finance Corporation and the Bank of the Netherlands under World Bank put forward the Equator Principle at the conference. In June 2003, 10 banks, including Citibank, Barclays Bank and Bank of the Netherlands, announced the implementation of the Equator Principle. The Equator Principle is a platform for assessing environmental and social impacts in project financing. The Equator Principle was based on the guidelines and policies formulated by IFC, and has established its own screening process by referring to IFC's screening procedures for environmental and social impacts of projects.

The main participants of green finance shifted from commercial banks to other non-bank financial institutions. Before the conference in Rio, The United Nations Environment Programme (UNEP) jointly issued Banking Industry Statement on Environment and Sustainable Development in New York, meaning that the UNEP Bank Initiative (UNEP BI) was formally established. In 1995, the plan was extended to the insurance industry by UNEP, and Declaration on Environment and Sustainable Development of the Insurance Industry was issued by Swiss Reinsurance and other companies. Insurance Institution Initiative (UNEP III) was established in 1997. To better adapt to the development of the financial industry, UNEP BI amended its statement. The original single banking business was extended to general financial services. Since then, UNEP BI has also been renamed the Financial Institutions Initiative (UNEP FII). In 2003, UNEP III and UNEP FII together held an annual meeting. At the annual meeting, financial plans and insurance plans were formally merged into financial initiative (UNEP FI), which marked the formal establishment of financial action institutions, covering all types of financial institutions.

Green finance started to dominate in developed countries, especially carbon finance. In 1997, the Kyoto Protocol was passed, and within 1 year of open signature, 84 countries have signed it. On 16 February 2005, the treaty came into force. The Kyoto Protocol has established three cooperation mechanisms, including the International Emission Trade (IET) mechanism, the Joint Implementation (JI) mechanism and the Clean Development Mechanism (CDM). Hence, the global carbon market has developed into JI market, IET market, CDM market and other markets of non-Kyoto Protocol system (such as Chicago Climate Exchange, New South Wales GHG emission reduction system and retail market, and so on). Due to the effort of Kyoto Protocol, carbon finance began to rise in developed countries, promoting the development of green finance.

Developing stage is from the beginning of 21st century till now. The concept of green finance has disseminated from developed countries to developing countries. The domain of green finance is gradually enlarging. The variety of green financial products is constantly enriched. With the development of green finance, the role of green funds has been highlighted. Therefore, in 2006, UNEP FI co-sponsored the establishment of the United Nations Principles of Responsible Investment (UN PRI) with the United Nations Global Compact. The organization regards asset management institutions, such as fund companies, as its core members and encourages them to act in accordance with the principle of responsible investment. In recent years, UN PRI has been rapidly developing. Its members include more than 1300 institutions, such as Citigroup, Morgan and Merrill Lynch. Its total assets under the control of its members have reached 45 trillion US dollars. In 2007, the European Investment Bank issued the first green bond. Since then, the global green bond market has developed rapidly at a compound annual average growth rate of more than 50%. The balance of green bonds has reached \$42 billion in 2015.

The international green financial system improves continuously. In July 2006, the New Equator Principle came out. On the basis of the existing principles, the "New Equator Principle" has enriched its content and expanded its scope of application. Up to now, the Equator Principle has undergone three revisions and supplements. It is the most widely recognized social and environmental risk management tool for commercial banks. In January 2014, UNEP established a project working group on Designing a Sustainable Financial System to explore how to promote policies that integrate the financial system more closely with sustainable development, or even make systemic changes to the financial system. In July 2014, the World Bank released the report

Environmental and Social Framework: Setting Standards for Sustainable Development, attempting to build a framework, requirements, standards and processes for green financial development. Although green finance is developing day by day, the existing international economic order and financial system cannot effectively guide private capital to the “green field”. Therefore, after constantly reflecting on the top-level design of international financial policy, UNEP proposes to reconstruct the international financial policy system and order so that the financial system can better adapt to the long-term demands of healthy economies. However, the responsibility of restructuring the international financial system should be vested in the International Monetary Fund, the World Bank and other institutions, instead of UNEP. To address this problem, UNEP launched the UNEP Inquiry project in 2014. UNEP Inquiry has established partnerships with more than 10 economies, such as the United States and the European Union, as well as with central banks, think tanks and chambers of commerce, to explore the future of the development of green finance.

Green financial coverage is gradually expanding. On December 12, 2015, Paris Accord was adopted at the Paris Climate Conference, arrangements for global activities to address climate change after 2020. In Paris Accord, countries have changed from passive mandatory emission reduction to active contribution in reducing greenhouse gas emissions, which indicates that the consensus of countries on sustainable development has grown from understanding to practice. After the signing of the Paris Agreement, the carbon market has entered the stage of globalization. On December 14 of the same year, a meeting of deputy heads of Finance and Central Bank of the G20 was held in Sanya. During the meeting, China and the United Kingdom formally approved the proposal of setting up the G20 Green Finance Research Group, to promote the consensus of developing green finance globally, sustainability of banks and capital markets, environmental information disclosure, and environmental pressure test, etc.

#### **4. Case Studies and Recent Situation of Green Bond**

Even though it is already a branch of green economy, still directly discussing case studies and recent developing situation of green finance itself is too much work. Thus, green bond, as a product of green finance, is chosen to be a representative for green finance. ‘70% of global greenhouse gas emissions come from cities, and many of the world’s most populated cities sit on coastlines, rivers and flood plains, they are particularly vulnerable to negative impacts from a changing climate.’ Cities are critical for constructing low carbon and resilient infrastructure for both economical and environmental reasons. Here are some case studies of green cities bonds across cities in different geographical region. Bonds play an indispensable role in financing climate infrastructure in cities. These case studies of green cities bonds contain cities that are already green bonds issuers and those cities that are potential issuers in the future.

(1) Wuhan, China (green bond issuer)

C40 member: Yes

Climate plan:

- 56% GHG per unit GDP reduction by 2020

Bond issuing powers: Yes, through local government financing vehicle

Total bond issuance last 5 years: More than \$5bn issued through the government financing vehicles, and more than \$4bn issued through transportation groups

Planned/current climate infrastructure projects:

- Wuhan Metro expansion
- Flood protection projects
- Wuhan - Huantou Public Bicycle Service System
- Bus Rapid Transit system

Country’s NDC commitment: 60-65% reduction in carbon

Estimated potential for green bond issuance: Significant (>\$500m p.a.)

(2) Tokyo, Japan (green bond potential issuer)

C40 member: Yes

Climate commitment: Reduce community-wide CO2 emissions by 25% from 2000 - 2020

Bond issuing powers: Yes, Tokyo Metropolitan Government

Total bond issuance last 5 years: Frequent bond issuer - over \$20bn issued

Planned/current climate infrastructure projects:

- Environmental measures for the venues of the Tokyo 2020 Olympics
- Conversion of lighting in Tokyo-owned facilities and street-lighting to LED

Country's NDC commitment: 26% by fiscal year (FY) 2030 compared to FY 2013

Estimated potential for green bond issuance: Significant (>\$1bn p.a.)

(3) New York, USA (green bond issuer)

C40 member: Yes

Compact of Mayors Commitment: 80% reduction in CO2 emissions by 2050

Bond issuing powers: Yes, through the city and through state agencies like MTA

Total bond issuance last 5 years: New York is a frequent issuer with total issuance since 2012 exceeding \$10bn

Planned/current climate infrastructure projects:

- \$1.7bn subway expansion<sup>16</sup>
- \$315m wastewater adaptation<sup>17</sup>

Country's NDC commitment: None

Estimated potential for green bond issuance: Significant (>\$1bn p.a.)

(4) Amsterdam, Netherlands (potential issuer)

C40 member: Yes

Climate commitment: Reduce CO2 emissions by 40% (1990 levels) by 2025

Bond issuing powers: Not directly but through municipal funding agencies or regional banks

Total bond issuance last 5 years: None as Amsterdam

Planned/current climate infrastructure projects:

- IJ bicycle river bridge
- EUR3.1bn North-South Metro<sup>22</sup>

Country's NDC commitment: EU Commitment – 40% reduction over 1990 by 2030

Estimated potential for green bond issuance: Moderate (\$100-500m p.a.)

(5) Cape Town, South Africa (green bond issuer)

C40 member: Yes, and C40 Cities Clean Bus Declaration

Compact of Mayors commitment<sup>43</sup>:

- 10% city-wide energy consumption from renewable sources by 2020
- 13% reduction in emissions by 2020

Bond Issuing Powers: Yes, through the City of Cape Town Metropolitan Municipality

Total bond issuance last 5 years: 1 bond ZAR1bn (\$76m) labelled green

Planned/current climate infrastructure projects:

- BRT bus system extension
- Coastal protection and adaptation

Country's NDC commitment: \$1.68tn in mitigation and adaptation investment economy-wide

Estimated potential for green bond issuance: Small - <\$100m p.a.

(6) Medellin, Columbia (potential issuer)

C40 member: Yes

Climate commitment: Commitments to adaptation made, but not mitigation

Bond issuing powers: Yes, through entities such as public utility Empresas Públicas de Medellín (EPM) owned by Medellín can issue bonds

Total bond issuance last 5 years: 14 deals amounting to approx. \$1bn

Planned/current climate infrastructure projects:

- Medellin Metro expansion
- Medellin rail upgrades

Country's NDC commitment: COP57.8bn will be required by 2030 to mitigate GHG effects, accounting for an investment of near COP3.18bn per year.

Estimated potential for green bond issuance: Small - <\$100m p.a.

Now, let us look at the dynamic of the development of green bond in the macrolevel from 2016. The amount of total global issuance in 2016, USD87.2bn, has achieved strikingly 107% growth on 2015, which only has USD42bn issuance. Such a huge burst thus promoted 2016 to become the most prolific year to date. From 2016 to 2017, with USD162.1bn total issuance in 2017, there was an 84% growth, slightly lower than the past year but still a remarkable number to note. In 2018, USD167.3bn total green bond issuance was merely 3% growth on 2017. The number of countries with green bond issuers has grown from 24 in 2016 to 37 in 2017 and to 44 in 2018. The number of issuers has increase from 200+ in 2016 to 400+ in 2017 and to 600+ in 2018. The number of bonds issued has changed from 200+ in 2016 to 1500+ in both 2017 and 2018.

One highlight from 2016 is that although in 2015 green debt raised by Chinese entities was less than USD1bn, it boomed to over USD23bn in 2016, elevating China to the first-place of 2016 green debt issuance country. China's raising awareness of environmental issues has materialized itself via policy and financial decision-making. China then remains top 3 country ranking with the US and France in 2017 and 2018. The US, China, and France shared 56% of 2017 global issuance and 47% of 2018 global issuance.

In 2016, the market was diversifying. An increasing number of countries, bond types, issuer types, rating and of use of proceeds have emerged in 2016. A new bond type-sovereign bond was first issued in December 2016 by Poland with the amount of EUR750m. In 2017, 3 sovereign bonds were issued by France (EUR9.7bn, USD10.7bn), Fiji (FDJ100m, USD 50m), and Nigeria (NGN10.7bn, USD30m). In 2018, new sovereign green bonds from Belgium, Indonesia, Ireland, Lithuania, Poland and the Seychelles, and two taps of France's GrOAT.

In 2018, there was a new trend that is merging connection between green bonds, green finance, and SDGs (Sustainable Development Goals). The labelled bond market has grown above and beyond green bonds. SDG, sustainability, and social bonds have joined in the market and become issuers and investors. The SDG frameworks have brought about in 2018, distinguishing between green and social eligibility criteria and allow the issuer to discriminate between 'sustainability', 'social', or 'green' based on the use of proceeds. Issuers can differentiate finance environmental projects and social projects more clearly, and therefore identify the bonds, which align with their investment criteria.

## 5. Conclusion

In general, the information above of green finance is all this paper has to display. That is the definition of green finance, the chronological development of green finance, and the recent data and case studies of a produce of green finance, good bond. It is plausible to say that the development of green finance is steady, and it is still growing optimistically. Just as its name presents, green finance is not just about economy but also about environment. The industry of green finance and other parts of green economy is truly worth pursuing, not only for the well-being of humanity now, but also for the great good of this entire planet in the long run.

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