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Green finance in the building and building construction sectors

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Working Paper for Sciences Po Urban School

***Green finance in the building and building
construction sectors***



Wei-Ting Chao

Abstract

As a prologue for the further studies for urban ecological transition, this working paper examines the essential elements in green finance, bringing forward insights to help understand the possible research questions on the green investment in buildings and building construction sectors. To begin, it explains why green finance has become a popular topic and why and how the building and building construction sectors have significant impacts, both positive and negative, on the ecological transition to a low-carbon society. To provide a better understanding on this topic, this paper then gives a current overview of green finance development as well as the related discussions on sustainable development since the 1990s. It also presents the most employed finance instruments for green finance. The final part presents the tendency of green finance in France, separating in three different actors' participations, namely, government, businesses, and citizens. The conclusion provides some reflections on existing literature and identifies several important issues on green finance in building and building construction for future research.

Key words: green finance, building and building construction, climate governance, sustainable development, ecological transition.

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Acronyms and abbreviations

ADB	Asian Development Bank
ADBI	Asian Development Bank Institute
CBI	Climate Bond Initiative
GP	Green Bond Principles
COP	Conference of Parties
ECB	European Central Bank
EIB	European Investment Bank
ESG	Environmental, Social, and Governance
GCF	Green Climate Fund
GHG	greenhouse gas
GEF	Global Environment Facility
IAEA	International Atomic Energy Agency
ICMA	International Capital Markets Association
IEA	International Energy Agency
IFC	International Financial Cooperation
IIB	Institute of International Bankers
IMF	International Monetary Fund
MDGs	Millennium Development Goals
PPP	Public-Private Partnerships
PWC	Pricewaterhouse Coopers Consultants
SDGs	Sustainable Development Goals
SROI	Social Return on Investment
TSC	Technical Screening Criteria
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WTP	willingness to pay

Introduction: making capital green

The Paris Agreement, a global agreement replacing the Kyoto Protocol, was adopted on the 12th of December 2015. The 196 Parties have agreed to set a limitation of the rise of global temperatures well below 2°C and sought to keep up the actions to stop the temperature rise at 1,5°C in relation to pre-industrial levels. To limit the rise in global temperature below 2 degrees from 1990 levels, there needs to be a global 40–70% cut in greenhouse gas (GHG) emissions levels by 2050 relative to 2010 (IPCC, 2014). Just before COP 21, the French Energy Transition for Green Growth Law¹ (so-called Energy Transition Law), was adopted in August 2015. This law plans to reduce greenhouse gases by 40% by 2030 (based on 1990), and simultaneously reduce the use of fossil fuels by 30% and increase the use of renewable energy to 32% (contributing 40% of electricity). The Energy Transition Law entered into force on 20th of May 2021. In the same year, the French government further passed the law of Climate and Resilience (*la loi climat et resilience de 2021*²) on the to draw a zero-carbon trajectory by 2050.

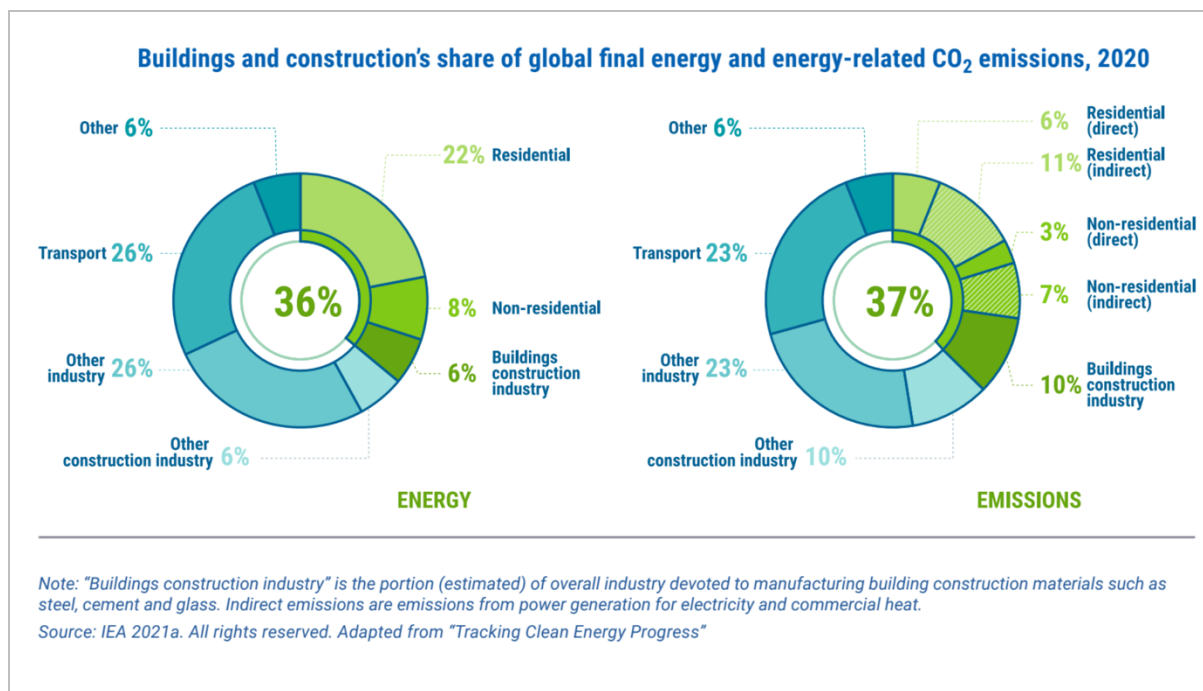
With the implementation of new regulations at both international and national levels, different sectors, including energy, manufacturing, transporting, building and construction, banking, investment companies and so on, are required to develop new economic models and business strategies to improve their ecological transition. Among all the sectors, the building and building construction sectors are one of the key domains. In 2020, these sectors account for 36% of global energy use and 37% of global GHG emissions (United Nations Environment Programme, UNEP, 2021; see

¹ The law in French is « *la loi sur la transition énergétique pour la croissance verte* ».

² After the French Climate Citizens Assembly announced 149 proposals in June 2020, in a spirit of social justice, the Climate and Resilience Law was formally proposed at the Ministerial Conference in February 2021 and passed the first reading at the National Assembly in May of the same year. In addition to the original 6 major themes, the bill has added "Climate and Environmental Assessment Provisions" which make the law more specific.

Figure 1 below³). The International Energy Agency (IEA) report also shows that, in 2021, these sectors combined are responsible for 30% of total global final energy consumption and 27% of total energy sector (IEA, September 2022).

Figure 1: Building and building construction sectors' share on global energy consumption and GHG emissions



Sources: UNEP (2021), 2021 Global Status Report for Buildings and Construction, p. 15.

Under the Paris Agreement, 90 countries included actions for addressing buildings-related emissions or improving energy efficiency in their Nationally Determined Contributions (NDCs)⁴ in 2015 (UNEP, 2021). Later in 2020, 136 countries mentioned emission reductions of buildings in their NDCs plans (UNEP, 2021). Meanwhile, these

³ Global GHG emissions from buildings operations fell temporarily 10% in 2020 due to the Covid pandemic.

⁴ Under the Paris Agree agreement, all the Parties must set national greenhouse gas emission reduction targets.

plans seem not sufficient and further ambitious actions should be taken. Although some countries have adopted policies that may have a future impact on the emissions and energy efficiency of buildings, around 70% of urban infrastructure that will be required to accommodate a fast-growing world is yet to be built (IRP, 2018). Put this differently, the impacts of the building and building constructions on the environment will continue to enhance if measures are not implemented.

In Europe, buildings are liable for 40% of energy consumption and 36% of GHG emissions, which principally result from usage, construction, renovation, and demolition (European Commission, 17/02/2020). In France, building operations contribute nearly 45% of the final energy consumed and are responsible for around 20% annually of those total GHG emissions, which primarily arise from the consumption of fossil fuels and electricity (*Ministère de la transition écologique, 2022*). Additionally, building and infrastructure materials and construction (typically referred to as embodied carbon) are responsible for an additional 13% annually GHG emissions (*Ministre de la transition écologique, 2022*). The ELAN law⁵ then imposes a 40% reduction in energy consumption by 2030 for all tertiary buildings whose surface area exceeds 1,000m². All these elements show the impacts of buildings and buildings construction sectors on the environment should not to be ignored.

Finance, as the path to allocating resources in the economy, is considered the core for sustainable development and fighting climate change and the other environmental challenges (Bigger, & Carton, 2020). In response to the increase in environmental regulations and to develop more sustainable business strategies, green finance, also called sustainable finance, has emerged. It attempts to introduce concepts such as energy conservation and environmental pollution reduction into financial services. Through mechanisms such as corporate loans, investments, financial products (e.g., green bonds), public or private funds support projects which can accelerate the transition to a low-carbon and sustainable economy (Sartzetakis, 2021). These tools

⁵ La loi n° 2018-1021 du 23 novembre 2018 portant sur l'évolution du logement, de l'aménagement et du numérique (ELAN).

attempt to provide solutions with balance between economic growth and environmental sustainability (Berrou, Dessertine, & Migliorelli, 2019).

Meanwhile, the projects and programmes of green finance vary⁶, which cover a great diversity of sectors and domains, and this fact has created difficulties in defining and formulating principles. With the expansion of the application of environmental governance in various industries and domains, defining and having a better understanding of green finance is crucial for making better strategies with available resources not only for the companies but also for the society.

This working paper aims to provide an overview of and a map of green finance, including its definitions, basic concepts, financing methods, and challenges. One main goal is to identify the fundamental elements of green finance, both in environmental domains (greenness) and financing practices (finance). It also attempts to identify the insufficiency of existing literature and to meet the need for building a greater comprehension of green finance with a view from sociology and political economy. Another objective is to fill the research gap concerning green investments in the building and building construction sectors, and to achieve this, the financing process and essential elements in this domain will be presented.

Five big sections compose this working paper, as presented below. Section 1 will demonstrate various definitions and key elements of green finance as well as the related discussions of sustainable development since the 1990s. Section 2 will review the existing studies in this domain. Section 3 will show the current most employed financial instruments for green projects. Sections 4 and 5 present the tendency of green finance in France, one section focuses on the role of the public actor (government) and the other on the private actors, including businesses and citizens.

⁶ The most common ones include renewable energy; pollution monitoring (reduction of pollution emissions and control of greenhouse gas emissions; clean transportation; energy efficiency; climate change; sustainable water and wastewater management; green buildings; products/production technologies for efficient ecological or circular economy development ; sustainable management of living and natural resources; and land use; terrestrial and aquatic biodiversity maintenance; waste reduction and recycling; waste to energy; sustainable livestock, smart farms for climate change.

This document will conclude with reflections on existing research and some recommendations on the future research on the topic on green finance in the building and building construction sectors.

I. Definitions and key elements

The primary task is to unravel what green finance is, which helps to frame the research and to find the research question. The fact that green finance includes numerous domains (e.g climate change, pollution, waste management, protection of biodiversity and landscapes, etc.) and sectors (financial sectors, businesses, governments, intermedia, governments, international organisations, etc.) has made the policy framing and regulations building very challenging. A precise and widely recognized definition is lacking. Many reports in fact do not define this term but direct talk about the mobilisation of funds (public or private), for instance, see the reports of International Financial Cooperation (IFC, 2013) and of Global Environment Facility (GEF, 2017). In other words, reports published by international and governmental organisations are full of different financial terminology but lack in-depth explanation of the fundamental elements of green finance.

While it lacks a unified and common-agreed definition, several attempts to define green finance can be found in the existing literature. First, some consider green finance interchangeable with 'green investment' and focus on the operation of banking (IDFC, 2012; Volz et al., 2015). For banking sector, green finance is defined as 'financial products and services, under the consideration of environmental factors throughout the lending decision making, ex-post monitoring and risk management process, provided to promote environmentally responsible investments and stimulate low-carbon technologies, projects, industries, and business' (Pricewaterhouse Coopers Consultants, PWC, 2013). This definition shows that the decision-making model of the financial industry must be revised to consider environmental factors. However, how the structured decision process should be reshaped and with what standards and methods are not clarified.

It is worth noticing that green finance has two layers of meaning. The first one, as mentioned above, is narrow, which refers to the sustainable development of the financial industry itself (see Nath, Nayak, & Goel, 2014; Lalon, 2015). Regarding this, many banks are gradually promoting greening credit card services, so-called eco-friendly credit cards (Indiegetup, 18/08/2022; Green matter, 22/09/2022). There are several common practices, such as replacing physical cards with virtual ones, giving higher rewards for environmentally friendly consumption, and providing cardholders with incentives to spend responsibly. A handful of banks have donated a percentage of every card purchase, transfer or cash advance to a non-profit organization or for environmental sustainability purposes (Nasdaq, 22/04/2015).

Banks have also bought offset credits to neutralise their GHG emissions from business activities. For example, BNP Paribas has engaged in using renewable energy and investing in compensation projects to reduce GHG emissions and announced its achievement of carbon neutrality⁷ in 2017 (BNP, 10/07/2020). In addition, these banks also encourage their clients to obtain 'carbon footprint label certification'⁸ and to use recycled materials to enhance their sustainable development. All these effects taken by the finance sector not only reduce the emissions of their business activities but also help to reduce the carbon footprint of their clients.

The second layer of green finance, which is the study object of this working paper, involves how the financial system can promote and stimulate environmental protection, sustainable economic and social development (for instance see Zadek & Flybb, 2013; IDFC, 2012; Volz et al., 2015; Meltzer, 2016; Gilchrist, 2021; Flammer, 2021). The

⁷ In short, carbon neutrality is a state of equilibrium between the GHG emissions made by person, company or an institution and their removal from the atmosphere by other activities (for example, by offset projects) (See European Parliament, 07/09/2022).

⁸ Carbon footprint label, also called 'carbon label' or 'carbon emissions label', is a labeling method employed to display the carbon emissions of products (including services), production process, company and personal activities. It normally include to the sum of the GHG emissions produced by a product in all stages of its life cycle from raw materials to factory manufacturing, distribution and sales, consumer use, and final disposal and recycling, converted into carbon dioxide equivalents (CO₂e) (see) (Thøgersen & Nielsen, 2016).

term here refers to any financial activity that can create a positive impact on the environment or programmes to promote a sustainable economic model (see IDFC, 2012; Zadek & Flynn, 2013; Wang & Zhi, 2016; Ehlers & Packer, 2017; Berrou, Dessertine, & Migliorelli, 2019; Gilchrist, Yu & Zong, 2021; Chevallier, Goutte, & Guesmi, 2021; Cunha, Meira, & Orsato, 2021; Frimousse & Peretti, 2021).

Compared with traditional financial services, green finance emphasises the sustainability of human development, to encourage governments, enterprises, non-profit organizations (NGOs), and individuals to invest in eco-friendly projects and to reduce activities that have a negative impact on the ecosystem and society. For instance, the United Nations Development Programme's (UNDP) put focuses on capital flow to green investment. Its website indicates that green financing is 'to increase level of financial flows (from banking, micro-credit, insurance and investment) from the public, private and not-for-profit sectors to sustainable development priorities'. The UNDP mentions the key part is to 'better manage environmental and social risks, take up opportunities that bring both a decent rate of return and environmental benefit and deliver greater accountability'. It also highlights the partnerships between different groups of actors (government, businesses, and citizens). The roles and functions of these actors will be presented in detail in the next section.

When it comes to the state level, the French government defines green finance as "a notion that defines the actions and financial operations that promote energy transition and the fight against global warming"⁹. The key element is that funding should not harm the environment and allow the development of a sustainable economy, and the Ministry of Finance Economy and Industrial and Digital Sovereignty (*Ministère de l'économie des finances et de la souveraineté industrielle et numérique*) highlights five methods, including 1) green bonds, 2) carbon markets, 3) ecological bonus-malus, 4) investments and green works: tax benefits for individuals, and 5) carbon tax or "energy climate contribution".

⁹ Please consult the site of the *Ministère de l'économie des finances et de la souveraineté industrielle et numérique* : <https://www.economie.gouv.fr/facileco/finance-durable#>

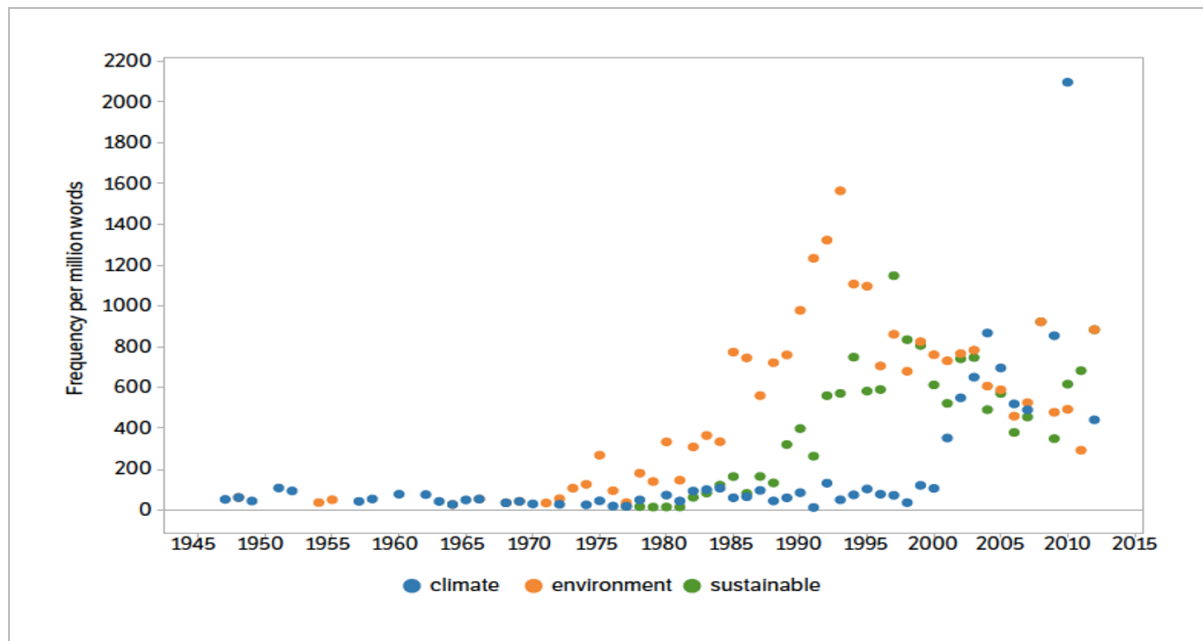
It is worth to noticing that the concepts of green finance are in fact developing with the evolution with the sustainable development. Discussions of sustainable development started in the 1990s (Pearce, Atkinson, & Dubourg, 1994; Chichilnisky, 1997), and this concept was widely recognized after the 2000 Millennium Summit¹⁰ with Millennium Development Goals (MDGs) (Annan, 2002; UN 2015). A point of observation is the degree to different issues are given priority. Figure 2 below displays that, starting from the 2000s, the frequency per millions of words on climate changes has quickly increased in the World Bank Reports (also see Moretti & Pestre, 2015).

As a results, this tendency has pushed some businesses and financial companies, for example Lehman Brothers¹¹, developed projects and business plans in climate investments. After 2010, the discourses on climate change (see the blue points in Figure 3) are several times more than discourses on general environmental issues (see the orange points) or sustainable development (see the green points).

¹⁰ The Millennium Summit was the largest meeting of world leaders in history, and various issues related to world development were discussed, including environmental problems, property, education, human rights, gender equality, public health, children protection, sustainable development, and so on (UN, 2015).

¹¹ In 2007, Lehman Brothers once released a report on climate change: "The Business of Climate Change" in response to the impact of global warming.

Figure 2: Environmental discourse from 1945 to 2015



Source: Figure made by Moretti & Pestre (2015: 78).

It is worthy noticing that the 2008/09 subprime crisis stimulated a global recession. At the same time, concerns of citizens about the climate crisis have been raised in the run up to the COP15 in Copenhagen. Green investment already increased by about \$30 billion in 2009 and 2010 in the Asia region (Eyraud Clements, & Wane, 2013). The economic recovery plans after the 2008/09 crisis have accelerated the investments in climate and environmental projects (Eyraud, Clements, & Wane, 2013). Some authors called these investments as “new Green Deal” (Aşıcı & Bünül, 2012).

In the 2010s more capital is flowing into green finance. For instance, the amount of climate finance in France has largely raised since 2013. After the signature of the Paris Agree in 2015, budding climate finance has become a top priority for governments, especially in developed countries, to meet their promoted targets in reduction GHG emissions and to raising funds for adaptation action (Debrah et al., 2022b). For example, investment in the energy efficiency of buildings continues to climb from \$129 billion (in 2020 dollars) in 2015 to US\$180 billion in 2020 (UNEP, 2021: 12). Despite the rapid growth of green finance after the 2010s, this concept is no doubt still developing.

The ecological transition has become one of the most important missions for governments, companies, and citizen. The United Nations released 17 Sustainable Development Goals (SDGs¹²) in 2015, as a guideline for all countries in the world to strive to promote sustainable development until 2030 (UN, 2022). To achieve the SDGs, governments around the world have increasingly invested in projects with environmental benefits, such as energy transition, public transport, reducing GHG emissions, improving air condition, energy efficiency, renewable energies, adaptation for climate change, biodiversity protection, water sanitation, industrial pollution control, and so on (UN, 2022).

To against climate change, the world's major advanced countries are following the trend of GHG reduction. For example, the United States, a country that is often regarded as a free rider in climate governance, is also actively decarbonizing electricity, planning to transform industries such as transportation, construction, and industrial processes into electrification or clean energy, and will push Congress to approve a bill requiring 80% of the electricity in the US comes from zero-carbon energy sources in 2030 (CNBC, 26/04/2021; NRDC, 12/08/2021).

After reviewing several definitions of green finance and the current elements, the following sections further examine the existing literature on green finance.

¹² The 17 SDGs are 1) no poverty, 2) zero hunger, 3) good health and well-being, 4) quality education, 5) gender equality, 6) clean water and sanitation, 7) affordable and clean energy, 8) decent work and economic growth, 9) industry, innovation and infrastructure, 10) reduced inequality, 11) sustainable cities and communities, 12) responsible consumption and production, 13) climate action, 14) life below water, 15) life on land, 16) peace, justice, and strong Institutions, and 17) partnerships for the Goals (see UN, 2022).

II. Existing literature and branches of studies of green finance

Starting from the 2010s, more studies on green finance have been published, covering various domains and sectors (see for example, IDFC, 2012; Zadek & Flynn, 2013; Wang & Zhi, 2016; Ehlers & Packer, 2017; Berrou et al., 2019; Gilchrist, Yu & Zong, 2021; Chevallier, Goutte, & Guesmi, 2021; Cunha, Meira, & Orsato, 2021; Frimousse & Peretti, 2021). In general, there are some most common subjects of studies on green finance, such as climate finance and carbon finance, sustainable strategies, and green financing process, as will be presented below.

- Climate finance and carbon finance

Among all the different domains, 'climate finance' is no doubt the most significant one. With the deepening impact of climate change, this issue has received high attention and increasing requests for solutions. As mentioned, the discourses of climate change have largely increased after the 2000s (see Figure 1 on page 14), which stimulate the development of climate finance. Climate change represents one of the severe macroeconomic and financial policy challenges for countries (Georgieva & Adrian, 18/08/2022), and climate change has impacts on other domains, such as biodiversity, ocean acidification, energy transition, and so on.

According to the definition of the United Nations Framework Convention on Climate Change (UNFCCC), 'climate finance refers to local, national or transnational financing—drawn from public, private and alternative sources of financing—that seeks to support mitigation and adaptation actions that will address climate change' (UNFCCC website, accessed on 17/11/2022). The goals are to reduce GHG emissions and minimize the vulnerability of human and ecological systems to negative climate change impacts.

Climate finance includes multiple aspects, which can be roughly divided into two aspects: mitigation (reduction or limitation of GHG emissions) and adaptation (living with the changing climate). During the 2007 Bali conference of parties (COP13), the participating nations agreed to the Bali Road Map which established a dual-track

process of adaptation and mitigation. With the framework of the UNFCCC, the Green Climate Fund (GCF) was established in 2009 after the Copenhagen Conference (COP15), as an operating entity of the financial mechanism to assist developing countries in against climate change (Schalatek, Nakhooda, & Watson, 2012). Precisely, the developed countries had committed to mobilise as of 2020 an additional annual 100 billion US dollars from public and private for southern countries (Bird, Brown & Schalatek, 2011). According to Simon Wilson, the GCF's chief of staff, most climate finance (at about 80%) is now still directed to mitigation projects, and only 20 % to adaptation (ahramonline, 16/12/2022).

A special branch of climate finance is called is 'carbon finance', which is a specific focus on pricing pollutions (Labatt & White, 2007; Hong, Karolyi, & Scheinkman, 2020; Giglio, Kelly, Stroebe, 2021). In short, governments around the world are putting prices on pollution (principally on GHG emissions) with different policy tools, such as emissions trading (see Coase, 1960; Klaassen, 1997; Ellerman, Convery, & De Perthuis, 2010) and environmental tax (see Pigou, 1920). These tools aim to push companies to reduce their pollution, increase efficacy in energy use, and put investment into research and technique innovation (Anderson & Real, 2015). Since these pricing policies directly increase the costs of companies, several financial products (future, options, etc.) have been designed to help them to hedge and to reduce spending.

Climate finance and carbon finance represent one important aspect of green finance but nevertheless do not cover all the domains. Waste management for example is also a main challenge for governments and international society. The UN experts predict that by 2050 there will be more plastic than fish, which will seriously impact the marine ecosystem (International Atomic Energy Agency, IAEA), 18/09/2022; Safety4sea, 19/07/2022).

- **Green investment projects**

The goal of green finance is to facilitate capital formation in projects and companies whose activities have favourable environmental impacts. To deal with different environmental problems, numerous green projects have been developed in different

sectors, which need to be funded by different sources. It needs to highlight those investments in green projects not just regard to capital flows but have impacts, positive or negative, on nature, ecosystems, humans, and the community. Better framing of green finance is believed to help to achieve the SDGs of the projects. For instance, the Asian Development Bank Institute (ADBI) report (2019: 2) identifies three challenges of implementing green projects, including identifying the projects, developing cooperation models that involve both the public and private sectors, and framing financing.

Various studies underscore the gap in funding green investment projects (GEF, 2017; ADBI, 2019; Hafner, et al., 2020; Debrah, Chan, & Darko, 2022). For example, according to the working paper of GEF (2017) supported by the World Bank, for environmental conservation projects, such as the conservation of land, forests, and water, an estimated \$400-600 billion per annum is required and more than \$350 billions of incremental capital for projects in renewable energy and energy efficiency (GEF, 2017: 2). Meanwhile, less than 15% of the needed capital has flowed to conservation projects. The ADBI report (2017: 2) also estimated that Asian countries needed at least \$USD 26 trillion between 2016 and 2030 on infrastructure investment to adjust to climate change, the principal projects are in the sectors of power (56%), transport (32%), telecom unications (9%), and water and sanitation (3%).

The cooperation between south and north countries is also emphasised (Galik & Jackson, 2009; Zadek & Flybb, 2013). Many green projects, such as renewable energy or offset projects, are in developing countries while the capital is from the North countries. Zadek and Flybb (2013) provoke for developing a south-originating green finance, which is different from the current North dominated model. For them, developing countries, in most situations also the host countries for international projects, provide the ground knowledge, assess risk differently, and may have different investment preferences than the developed countries. Most importantly, many green projects have long-term impacts on land use, forest policy and indigenous rights (Galik & Jackson, 2009).

Reports also point out the extension activities of green investment, such as the cost of project preparation, operational costs of public policies, and land acquisition costs

(Zadek & Flybb, 2013). Take projects of green buildings to illustrate, one of the crucial components is to choose the right land (Kibert, 2016), and various elements need to be taken into consideration, including marketability, location, cure title issues, easements or title exemptions land excavation costs, wildlife, and agriculture exemptions, and so on (Green Energy Money Website, accessed on 18/12/2022). In short, most reports and studies believe that there are still not enough investments in green projects.

- **Regimes building**

Another important topic on green finance is regimes building, which refers to the construction of legal, economic, and institutional frameworks and conditions of green financial instruments and regulations (Berrou et al., 2019; Dikau & Volz, 2018). One major task is to identify the principal standards of green finance, which is challenging since investment targets vary, including climate change policies (mitigation, adaptation, carbon neutrality, etc.), waste processing and recycling, economic adaptation and resilience, renewable energies, energy efficiency, biodiversity protection, water sanitation, industrial pollution control, and so on (Lindenberg, 2014).

Regulations and rules could be built at international level, regional level, and national level, as well as by private sectors. At the international level, the rules could be built by international organisations such as the World Bank, International Monetary Fund (IMF), the European Investment Bank (EIB), the European Central Bank (ECB), and so on, or by international negotiations and agreements between countries (for example during the Conferences of Parties (COP) of the UNFCCC) or between private actors (for example, with Institute of International Bankers).

For instance, the financing rules of the GCF are mostly set by the World Bank (Bird et al, 2011). GEF (2017:2) lists several features of these instruments that need to be handling with, including:

- 1) Level of seniority: junior equity versus preferred stock
- 2) Channel through which the flow of finance is arranged

- 3) Intermediary actors: types of investors and investment vehicles
- 4) Terms of the agreement
- 5) Origin of funds
- 6) Risk management

At the region level, supranational organisations, for example the EU institutions, has also tried to establish principles for green financing. The EU aims to direct private investment toward a climate-neutral economy, and a seven-year European budget is allocated to ensure net carbon emissions from GHG elimination and decoupling economic growth from resource use Ecosphere.

The most well-known politic is the EU taxonomy initiated in 2020 (Regulation (EU) 2020/852¹³). This policy is expected to assist the EU to meet its climate and energy targets for 2030 and reach the objectives of the European green deal. This legal construction expected to increase the transparency and fairness of financing in environmental projects (Schütze, et al., 2020). Six environmental objectives are established including:

- 1) Climate change mitigation
- 2) Climate change adaptation
- 3) The sustainable use and protection of water and marine resources
- 4) The transition to a circular economy
- 5) Pollution prevention and control
- 6) The protection and restoration of biodiversity and ecosystems

In addition, based on the explanations of the EU taxonomy, through five steps, enterprises, investors, and policymakers can correctly invest funds in green projects, and gradually carry out green financial planning. These steps, emphasising on

¹³ Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation (EU) 2019/2088 (Text with EEA relevance).

usability, compliance, and legality, explain the financing process and rules. These include:

Table 1: Five steps to fund in green projects standardized by the EU taxonomy

Step 1:	The financial industry must clearly define the purpose of credit financing
Step 2:	Classify business activities for which the use of funds is not clearly defined
Step 3:	According to the customer's business behaviour, define its category in the classification system
Step 4:	Customers are required to disclose the necessary information to comply with Technical Screening Criteria (TSC) and MSS, and to prove whether the company's contribution conforms to TSC based on scientific evidence.
Step 5:	The evaluation method of DNSH and MSS depends on the degree of legal compliance of the customer and its assets, and the fund use plan must also have time flexibility

Table made by the author; source: EU Technical expert group on sustainable finance. (2020). TEG final report on the EU taxonomy.

Mostly, environmental politic involve different degrees of state intervention on economic activities (Reinhardt, 1999; Hepburn, 2010). States need to set their goals to reduce GHG emissions as well as put extra-cost on pollutions (environmental taxes or emissions trading) so that the firms would have the motivations to reducer the emissions of their business or production activities or innovate their equipment or techniques. Besides providing public funds for policy implementation, governments also function as a catalyst to motivate private finance at scale (GEF, 2017; Georgieva & Adrian, 2022).

Changes in countries' regulatory frameworks are believed to promote environmental policies as well as green financing (Berrou et al., 2019). For example, in countries or

regions that have carbon pricing policies, businesses pay more attention to the emissions of their products in the production process and are more willing to (or be forced to) put investment in environmental projects (such as offset projects, renewable energy, improving energy efficiency, and so on). In the EU, the region considered to have strong climate-ambitious policies, firms are putting increasing investment in R&D and technologies to meet the needs of green transitions (Grassano, et al., 2021).

The public sector is responsible to create enabling atmosphere for green financings, such as raising awareness on environmental issues, setting sustainable finance roadmaps, harmonizing financial incentives, changing countries' regulatory frameworks, and assisting the private sector. The government should also guide financial institutions to invest and finance green energy industries, gradually expand investment and financing to other green industries and promote sustainable development plans and innovate and develop sustainable financial products and services. Nevertheless, according to the UNEP report (2021), two third of the countries where most new construction will arise still does not have sufficient mandatory building regulations.

Governments are also believed to be responsible for the capacity building of private actors (Debrah et al, 2022). This is a process of building of human, institutional, and infrastructural capabilities to develop a safe, stable, and sustainable economy through mentoring, training, education, physical projects, and infusion of financial and other resources. Take green building to illustrate, capacity building includes learning knowledge about smart green buildings, building a common platform for low-carbon savings, and integrating other policies (such as smart energy, water resources, community management, community health and care, safety and disaster prevention, etc.). The tasks of governments include not only delivering knowledge and capabilities but also promoting cooperation between enterprises in different sectors.

Regimes build by private actors, such as business companies, associations, are also important. The practices of private companies also often become the norm. In many, these regulations are executed faster and more forcefully for companies to follow. This concept will be better explained in section 5.

After reviewing several important studies in green finance, the next section will present several most employed financial instruments in green finance to allow the authors to understand how green finance operation around the world.

III. Green financial instruments

One important element in green finance is resource (funds), including not just public funds from governments or international organisations, such as the World Bank or the EIB, but any financial assets from various sectors (for example investment banks, businesses, non-profit organisations, individuals, and so on) to projects providing environmental benefits. The financial instruments include equity, grants, green bond, loans, guarantee, subordinated debt and so on (GEF, 2017). This section presents two most common tools in green finance: **grants**, green bonds and green loans, and the deployment of green insurance.

- Grants

A big part of grants for green projects are the public funds from governments, international organisations (such as the World Bank, the EIB, ADBI, etc.). For instance, grants the major source of the GEF funding, which help to overcome policy barriers, strengthen institutional capacity, or demonstrate innovative conservation approaches, laying the foundation for further investments. At the EU level, based on the European Green Deal, between 2017 and 2027, the EU funds green projects in different domains, including:

- 1) fresh air, clean water, healthy soil, and biodiversity
- 2) renovated, energy-efficient buildings
- 3) healthy and affordable food
- 4) more public transport
- 5) cleaner energy and cutting-edge clean technological innovation

6) longer-lasting products that can be repaired, recycled, and re-used

7) future-proof jobs and skills training for the transition

8) globally competitive and resilient industry

Additionally, in August 2022, the French government announced to operate “the green fund” (*Le fonds vert*), an unprecedented system to accelerate the ecological transition in the territories, starting in January 2023. This fund is endowed with two billion euros in decentralized credits for prefects, which intended to finance projects presented by local authorities and their public or private partners in three areas: environmental performance, adaptation of the territory to climate change and improvement of the living environment¹⁴.

The green fund for energy renovation measure for local public buildings is part of the extension of credits allocated to the energy renovation of public buildings under the French Recovery Plan, for which one of the themes focused on the ecological transition. Brief, this fund will support projects renovation of public buildings to reduce their consumption, energy and better comfort for agents and users (Ministère de la transition écologique, 2023).

- **Green bonds**

One popular tool for funding is green bonds, which have been the study subject for various publications (Baker et al., 2022). This is a type of fixed-rate financial product, and their holders can receive interest returns (Ehlers & Packer, 2017; Flammer, 2021). The bonds are expected to direct the proceeds into projects that create environmental benefits, as such, these funds have less flexibility for the institutions (governments, banks, investment companies) in determining the investments and the using proceeds.

¹⁴ See the Website of the Ministères Écologie Énergie Territoires: <https://www.ecologie.gouv.fr/fonds-vert>

One of the world's leading issuers is the World Bank, who has issued green bonds worth US\$ 9.1 billion between 2008 and 2016 in sixteen countries, and has invested in projects including renewable energy, clean transportation, climate resilient infrastructure, forestry, and agricultural land use, and so on (World Bank, 2016). There are 90 green bond-eligible projects with commitments totalling US\$15.9 billion (World Bank, 2016). The funds raised by these bonds are dedicated to 'environmentally friendly' projects, which is their major difference from ordinary bonds.

Like conventional bonds, the issuer of green bonds can be the governments, institutions, or companies. The bond issuer or guarantor guarantees to repay the principal and certain fixed or floating interest returns within a certain period. Their risk weights and credit ratings are derived through customary assessments of the issuer and are tradable in the international secondary bond market.

In addition to complying with EU sustainable classification rules, companies issuing green bonds in the future must disclose the use of funds, regularly report on environmental benefits, accept external review, and publish external review reports to minimize greenwashing. The advantage of this tool is its low thresholds for issuance by the government or institutions. Put differently, it is convenient to raise funds with green bonds and at the same time firms can also fulfil their corporate social responsibilities with this tool. This is also a win-win situation for enterprises. They often have lower interest rates and tax incentives with government promotion policies and their consumers are more willing to purchase bonds for environmental purposes. Moreover, green bonds can stimulate the development of cooperation between the state and private companies (Kochetygova & Jauhari, 2014).

The volume of green bonds stayed low in the 2000s, started to arise around 2010, and have grown faster after 2015 when the concepts of green finance received more attention (see figure 2 below; Green Bonds Initiative, 2014, 2015, 2016). The analysis of Climate Bonds (2021) shows that the worldwide annual trillion in green bonds was only near \$100 billions in 2016, passed more than \$300 billions in 2020, and reached \$467 billions. Estimation of Green Bonds Initiative (2021) also shows the amount will probably \$1000 billions by 2023 (see Figure 2 below).

Figure 3: the growing annual trillion in green bonds worldwide

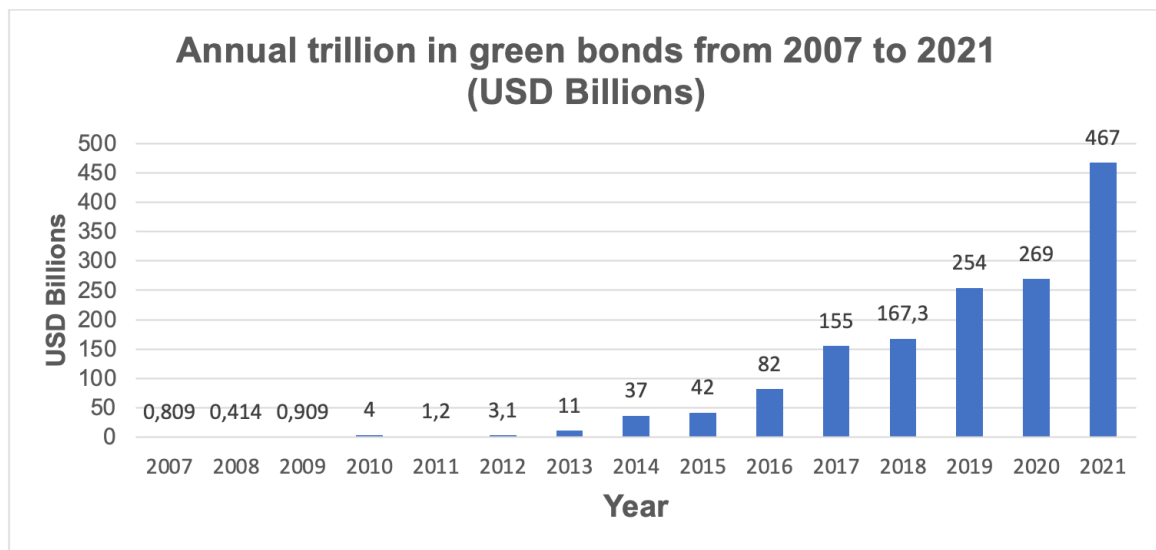


Figure made by the author. (Source: Green Bonds Initiative, 2014, 2015, 2016, 2021). Figure is provided for illustrative purpose.

In France, to confirm the leading role of the continuity of the ambitions of the Paris Agreement, In January 2017, the *Agence France Trésor* (AFT) inaugurated the green sovereign bond (*obligation souveraine verte*) with a maturity of 22 years¹⁵ for an amount of 7 billion of Euros (Ministère de la Transition écologique, 01/12/2021). In March 2021, the AFT lunched the second green bonds for an amount of €7 billion¹⁶ (Ministère de la Transition écologique, 01/12/2021). It is worthy noticing that France is the first country in history to issue a green bond, which is a big step and a symbol of France’s leadership in this domain, as mentioned by Pascal Canfin, Former Director General of WWF France.

He claimed that "this announcement is one more sign of France's leadership in green finance. It has two important positive effects: the first is to show that it is possible and

¹⁵ The 1.75% green sovereign bond June 25, 2039

¹⁶ the OAT 0.50% 25 June 2044

therefore to encourage other countries that are considering doing so, like China or the United Kingdom. The second effect is to secure nine billion in public funding for the ecological transition whatever the outcome of future elections." (WWF, 2016).

Meanwhile, it is still lacking standers as to what constitutes 'environmental', 'green', or 'sustainable'. These bonds have been criticized for lacking transparency and may be used in other (polluting) investments. Projects also risk being rejected or stopped due to insufficient funds. Investors need to pay more attention to these hidden concerns. Another method to fill the green finance gap is to steer investments toward green projects, such as renewable energy (Mazzucatoa & Semieniukb, 2017; ADBI, 2019). For instance, the increase of global energy investment (around 8%) was mainly in clean energy according to the IEA report (22/06/2022).

- **Green loans**

One type of developing mechanism, often used by the private sector, is 'green loans' and 'sustainability linked loans', which are financial instruments that enable borrowers to use the proceeds to exclusively fund projects producing substantial outcomes for nature and society (Miroshnichenko & Mostovaya, 2019). There are also loans for industrial transformation, which are specially used to assist in the alteration of highly carbon-intensive industries, such as the petroleum chemical industry, heavy industry, automobile manufacturing industry, and so on. Investments banks and associations have started to run business.

Green commercial building loans are a good example, these loans fund new buildings in keeping with high environmental standards or retrofit existing ones to improve energy efficiency, reduce GHG emissions, and waste management (World Bank, 2019). Banks like Barclays and BNP Paribas, provide their clients' businesses with

financing that places green principles to reduce GHG emissions in the offices (see the Website of Barclays Green Loan¹⁷; BNP Paribas, 06/12/2022).

The amount of these loans has been increasing year by year. Bloomberg’s data indicate that global green loans were US\$15.8 billion in 2014, US\$28,7 billion in 2015, and 38, 1 in 2016 (See Figure 2 below). In 2017, besides green loans (US\$45.6 billion), there were also sustainability-linked loans (US\$10.6 billion). In 2018, the volumes of these two types of loans exceeded US\$99 billion, with green loans accounting for US\$55.9 and sustainability-linked loans accounting for US\$43.2 billion (see Figure 4 below).

Figure 4 Aggregate volumes of green and sustainability linked loans from 2014 to 2019.

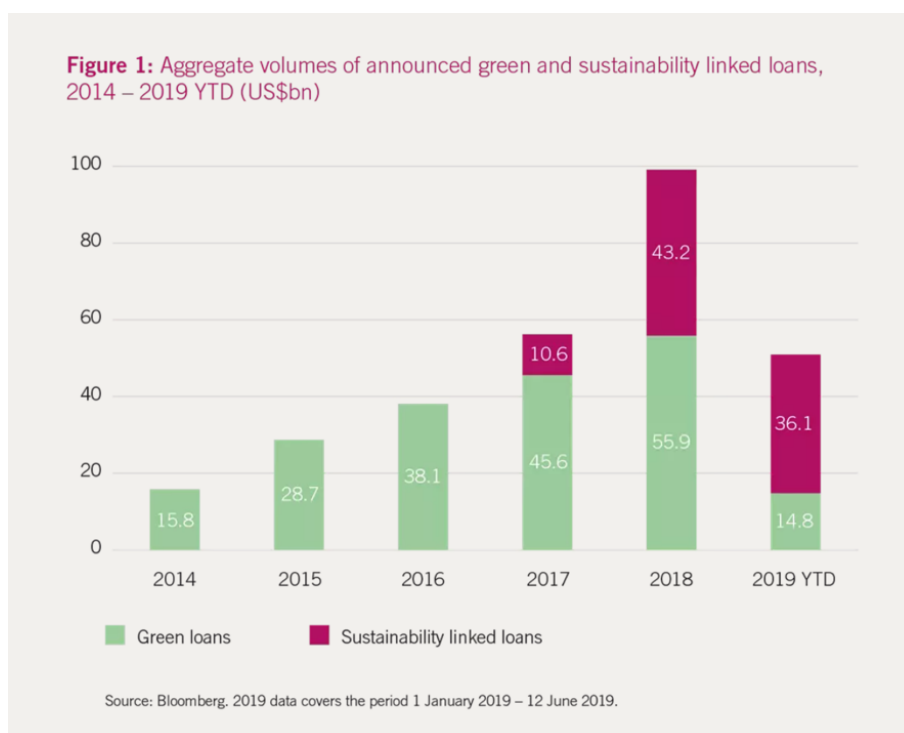


Table made by Linklater (<https://www.linklaters.com/en/insights/thought-leadership/sustainable-finance/the-rise-of-green-loans-and-sustainability-linked-lending>); Source: Bloomberg, 2019.

¹⁷ Barclays Green Loan: Good for the planet, good for your business (<https://www.barclays.co.uk/business-banking/borrow/green-loan/>).

Similar situation to green bonds, there are still no universally recognised standards to determine what qualifies as green or sustainability-linked loans. Without recognized market standards might cause problems or conflicts resulting from diverging approaches being taken on what amounts to green or sustainability-linked loans. Private actors, such as investment banks and leading financial institutions (e.g., Loan Market Association, Asia Pacific Loan Market Association), have tried to build rules and standards for green finance.

Several banks and leading institutions, such as HSBC and Loan Syndications and Trading Association (LSTA), have built their Green Loan Principles (GLP) to guide the (please consult LSTA, 2021; HSBC, 21/09/2022). The Asia branch of the bank HSBC has developed its GLP for green loans, covering use of funds, project evaluation, selection process, and quantitative report (HSBC, 21/09/2022). Green loan funds are only allowed to be used for green investments and projects, and governance, traceability and transparency are emphasized to avoid the risk of greenwashing (Berrou et al., 2019). In the approval of green loans, the bank attaches great importance to the regular performance evaluation reports of enterprises and links the loans with sustainable development and expected target performance.

When it comes to building and building constructions sectors, for the purchase or construction of green buildings, many commercial banks, such as DBS bank¹⁸ and Barclays¹⁹, have green building preferential loan programmes providing preferential interest rates or expenses. It is worthy noticing that the adoption of these new financial tools first stemmed from market practices, without any regulatory constraint obliging anyone to use them (La Tribune Partenaire, 20/04/2022).

- **Green insurance system**

A green insurance system developed by the finance sector is also emerging, which is an effective claim settlement system for enterprises with high environmental risks to

¹⁸ Please see DBS Bank's Website: <https://www.dbs.com.sg/corporate/insights/bridging-real-estate-green-financing-gap>

¹⁹ Please see Barclays's Website: <https://www.barclays.co.uk/business-banking/borrow/green-loan/>

protect the rights and interests of victims after pollution accidents (Stricker et al., 2022). It is worth realising that the ideas of green insurance have already emerged in late 1990s and the early the 2000s. For instance, big companies, such as Enron, have such insurance products. Meanwhile, in the past, green insurance mainly focused on pollution liability insurance related to the environmental damages. In recent years, it has been extended to include insurance products with environmental properties or elements.

Mainstream green insurance products can be roughly divided into two types. One is insurance that charges different premiums based on the degree of environmental protection; the other is insurance for environmental protection technologies and emission reduction technologies (see Zona, Roll, & Law, 2014; Stricker et al., 2022). For example, the premiums charged by insurance companies for driving electric vehicles may be cheaper than general car insurance.

This section presented the most employed financial instruments nowadays. As shown, environmental management has been expended on many items of financial service, including bonds, loans, and insurance. It seems that green finance is blooming or represents the tendency for financial development. One approach to see the fundamental elements of green finance is to identify the missions, roles, and functions of different actors (governments, international organisation, enterprises, citizen, NGOs, etc.). The coming section will first focus on the development of green finance in France, including the role of governments, the policies adopted, especially in building and building construction sectors.

IV. Green finance in France: actions taken by the government

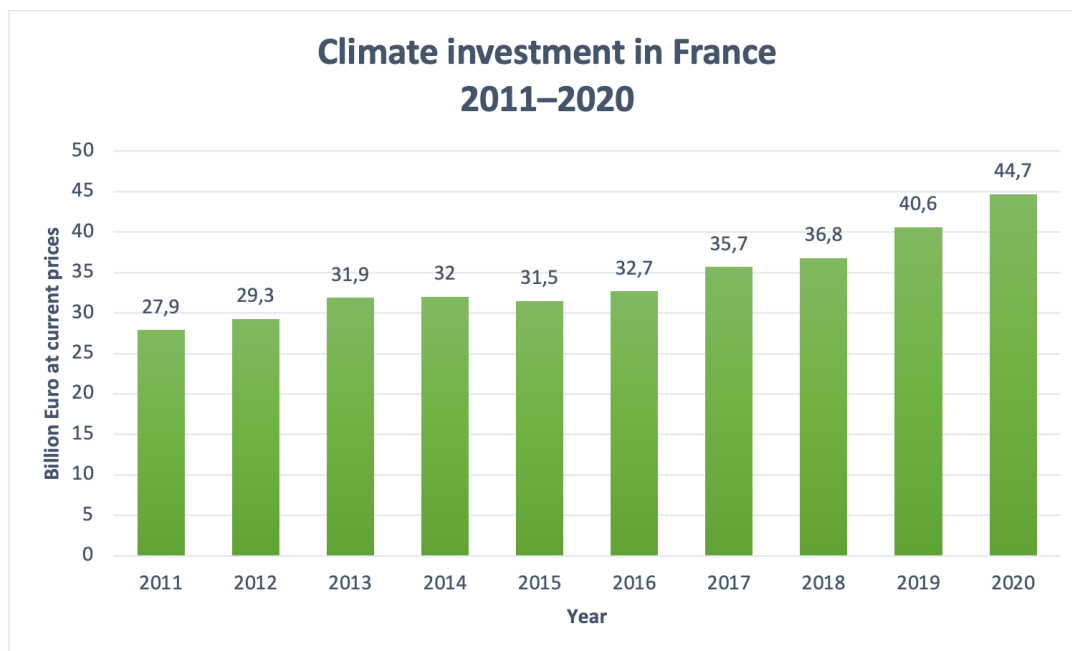
Governments play an essential role in establishing regulatory frameworks, institutional setups (competent authority and laws) and elemental rules (traffic designing, subsidies, guarantees, etc.) for green finance. As the host country of the historical COP 21, France has played a more active role in fighting climate change after the signature of the Paris Agreement. The Energy Transition Law was adopted in 2015 with the plan to reduce greenhouse gases by 40% by 2030 (based on 1990). In 2017, President

Emmanuel Macron launched his "Climate Plan" with the slogan "make our planet great again" (Nelson, 2017). The most eye-catching measures are restrictions on high-emission industries, banning the sale of fuel vehicles, and no longer exploiting fossil fuels by 2040. The long-term goal is to make carbon neutral to the French economy.

As mentioned, green finance is defined by the French government as "a notion that defines the actions and financial operations that promote energy transition and the fight against global warming". Following this definition, the primary missions of French government are to promote energy transition and the fight against global warming. Its plan on the green transition can be further grouped into four main parts 1) improving energy efficiency, 2) developing renewable energy. 3) upgrading infrastructure (including traffic and buildings), and 4) renewing nuclear energy and other greenhouse gas emissions reduction programs (I4CE, 2017).

Figure 5 shows that the amount of investment in climate change projects in France between 2011 and 2020 (data from I4CE 2021 report). The investments doubled rapidly from €27.9 billion to €31.9 billion from 2011 to 2013, and then stabilised in the next few years. The average investment amount from 2013 to 2016 was about €32 billion, in 2017 it was also at the level of €35.7 billion, and it reached €44.7 billion in 2020 (I4CE, 2017 & 2021).

Figure 4: the increasing investment in climate finance in France

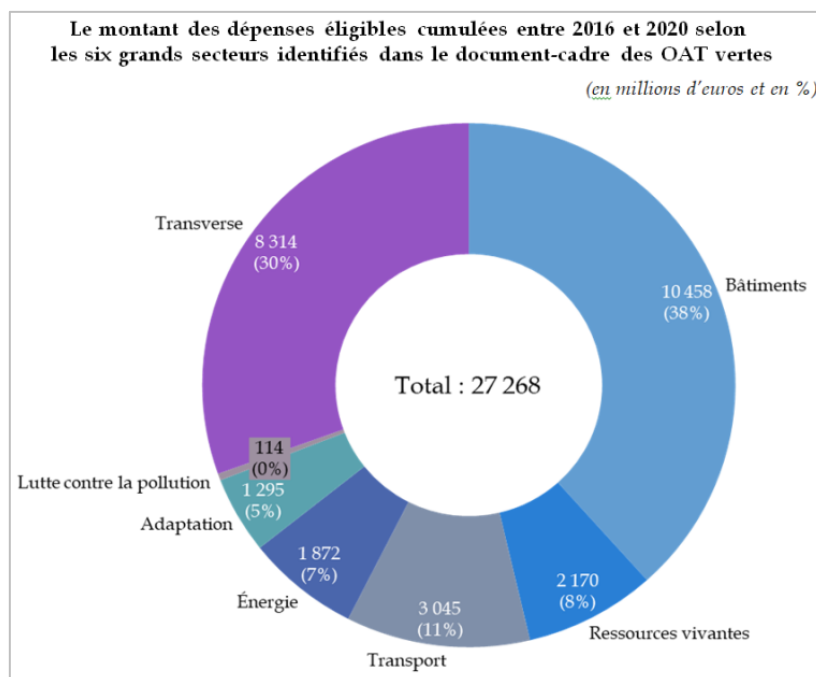


Source: I4CE (2021). Landscape of Climate Finance in France. Figure is provided for illustrative purpose.

In 2014, around 13% of climate investment flowed into the building sector (I4CE, 2017). This number has increased with the growth of total climate investments. Take the French green bonds to illustrate, between 2016 and 2020, around 38% of these funds flowed into buildings (*bâtiment*), which was even higher than those for transportation sectors (30%).

One important element is the 2018 ELAN law, which imposes a 40% reduction in energy consumption for all building tertiary whose surface exceeds 1,000m², by 2030; and this reduction must even reach 50% by 2040; and 60% by 2050 (La loi n° 2018-1021 du 23 novembre 2018). The reduction in energy consumption is required to take place either through renovation work, either through actions relating to the behaviours of occupants and operation/maintenance of heating, cooling and ventilation equipment.

Figure 5 The amount of cumulative eligible expenses between 2016 and 2020 according to the six major identified in the framework document of green OATs



Source: Table made by *Commission des finances du Sénat*, 2022, p.2.

As part of a planned green industry law, the French government recently also is planning to introduce tax incentives to spur investment in climate-friendly industrial projects (Reuters, 08/03/2023).

V. Private sectors: businesses and citizens

Many studies stress sustainable finance strategies, such as impact investing, businesses' blueprint for sustainable development, plans on GHG emissions reductions, and so on (Al Muhairi & Nobanee, 2019; Cunha, Meira & Orsato, 2021). They study how companies could and should respond to the cascade of environmental regulations and new business atmosphere (which could be shaped either by governments or by citizens). Several authors further emphasizes on corporate engagement in environmental responsibility in financing (Gilchrist, 2021; Flammer,

2021). It is regarded as a business model that considers both environmental protection and sustainable corporate profits and is synonymous with the balance between profit and sustainability. It is believed, in the future, the financial decisions of companies must take environmental issues (such as climate change) into consideration and propose a completely sustainable development framework.

- **Business sectors:**

Businesses, such as investment banks, manufacturing companies, industries, and so on, are (potentially) large source of funds for environmental projects. Private capital is believed to be crucial essential in securing the scale of green investment required (Zadek & Flynn, 2013). For example, in 2022, Total Energy's investments²⁰ in renewables and electricity accounted for 25% of its total ones, and the company has become a leader of renewable electricity in France and worldwide (Total Energy, 09/12/2022). Another case is Google, its foundation (the Google.org Impact Challenge on Climate Innovation) has committed \$US 30 million to fund projects that accelerate technological advances in climate information and action (Google.org website, 2022).

Researchers and policy markets are trying to answer several questions. For what drives businesses to engage in environmentally responsible practices, and what are the potential benefits of companies (Gilchrist, 2021)? It is worth noticing that the cooperation's' perspective of greenness and green finance could be (very) dissimilar from those of governments and citizens.

A popular topic in the 2000s was Corporate Social Responsibility (CSR), which means that companies are also responsible to society and eco-systems, and their missions are not just making money for shareholders, providing employment opportunities and creating wealth, but also contributing to the sustainable development of society and the environment (Chapple & Moon, 2005; Jamali & Mirshak, 2007; O'riordan & Fairbrass, 2008). The resources and capabilities possessed by large multinational corporations, such as Google, Facebook, and Apple, even exceed those of many

²⁰ Total Energy is one of the biggest petrol companies in the world.

governments, they also control production and trade, so their engagements in CSR action could have significant impacts and contributions.

Milton Friedman, the winner of the Nobel Economy Prix, wrote in the New York time (13/09/1970) that 'the social responsibility of business is to increase its profit'. Although the idea that 'making money is the only duty of companies' is out of fashion, profit is still a crucial part of CSR for companies. Losing money not only makes it irresponsible to its shareholders but also want to take care of other people in the company, such as employee salary increases and participation in public welfare activities. Making a profit, in a legal and ethical manner, is key to the success of CSR for companies. Therefore, green finance could help them to find a balance.

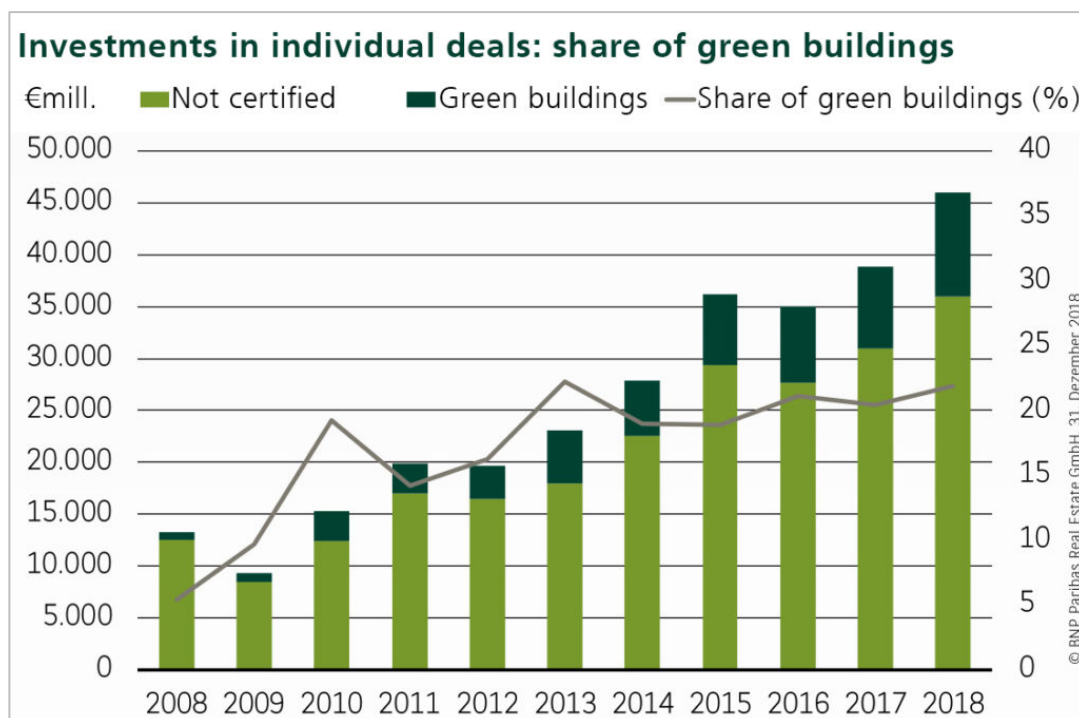
Several tools are created to evolute the outcome of CSR. For example, the Social Return on Investment (SROI) is a quantitative indicator used to evaluate CSR benefits, which means that investing one dollar can create several dollars of social value (see Millar & Hall, 2013). SROI transforms the investment results from qualitative description to "quantitative" tracking and management through monetization. Thus, CSR can be managed digitally and become a reference when planning CSR strategies. Recently, supply chain management has also become essential for implementing CSR. Enterprises can exert a positive influence on upstream and downstream cooperative manufacturers, on example is Apple has required its suppliers to adopt green energy and to low-carbon techniques (Apple Newsroom, 31/03/2021).

The role of the financial sector should be highlighted again, since it is the central of green financing. Banks and investors thought financial markets allocate funds to different sectors and projects. These financial actors, as a leader, have the function to push other industries to gradually incorporate the sustainable concept of ESG and SDG into operations strategy. For instance, banks around the world are increasingly integrating CSR policies into their business practices. As of March 2021, 116 financial institutions in 37 countries have officially adopted the Equator Principles (EPs), covering most of the financing projects in emerging markets and developed markets (Wright & Rwabizambuga, 2006). This agreement includes 10 basic principles, they are 1) review and grading, 2) environmental and social assessment, 3) applicable environmental and social standards, 4) environmental and social management system

and action plan for equator principles, 5) stakeholder engagement, 6) complaint mechanism, 7) independent review, 8) convention, 9) independent monitoring and reporting, and 10) reporting and transparency (see the Equator Principles, 2006).

Regarding the building sector, the investments in green projects have also increased. The 2018 report of BNP Paribas on Real Estate also demonstrate that its investments in green building have also been risen since 2008 (see Figure II below). In 2018, the investments in green building reached almost 10,000 million euros.

Figure 6 Investments in green buildings of the BNP banks



In addition, these private actors hold several functions, including financial share, technical innovation, managerial role, local knowledge, and backward and forward linkage. In fact, firms' ESG performance has been a popular study topic for more than a decade (Gillan, et al., 2010; Tarmuji, Maelah, & Tarmuji, 2016; Lokuwaduge & Heenetigala, 2017). For building and building construction sectors, one important organisation at the international level to create regimes and regulations is the Global

Alliance for Buildings and Construction, a multi-stakeholder alliance committed to delivering a zero-emission, efficient and resilient.

Nevertheless, these mechanisms have been criticized for being too broad and vague, and many banks have not actually complied with them, but keep financing polluting industries and projects (Schepers, 2011). For example, in the case of the 2016 North Dakota oil pipeline project, 13 of the 17 banks that financed the project signed the Eps (Reuters, 10/09/2019). In addition, according to the contract, financing would continue even if an accidental oil spill from the pipeline that pollutes the Missouri River and Lake Oahe. In other words, principles have changed little even with the EPs.

Another focus is Public-Private Partnerships (PPPs), which is an essential element to operating several financing mechanisms, such as green bonds (Ordonez, Uzsoki, & Dorji, 2015). As mentioned, private capital are potentially huge funds for green projects, at the same time, they need the supports from governmental polices. Moreover, in many situations, it is the governments who invests money for private sector (project managers, construction companies, private organizations, and so on) to execute green projects. Increasing public constructions have adopted the PPP.

Another persisting concern is greenwashing and the other speculative behaviours (Zhang, 2022; Baldi & Pandemiglio, 2022). In a few words to explain greenwashing, companies or organizations use different methods (for example, advertising, donations, participating in ecological conferences, investing, etc.) to give themselves a misleading environmentally friendly image (Delmas, & Burbano, 2011; De Freitas Netto et al, 2020). While they highlight environmental concerns, they are far from having them in their practices.

In 2022, Eco-Business recorded eight cases of brands called out for greenwashing, including HSBC, Michelin, Santos, the music band Coldplay, Deutsche Bank, and the big oil companies (08/12/2022). The case of Deutsche Bank is especially remarkable since it was the first time in history that a lawmaker (the German government) wrapped up a multinational business for greenwashing investments. The bank was accused of falsely claiming that more than half its assets (around \$900 billion) were invested in Environmental, Social, and Governance (ESG) projects (Les Echos, 31/05/2022;

Greenly, 29/09/2022). To have a more in-depth understanding of green finance could also help to make better regulations and monitoring mechanism as well as to reduce the risk of greenwashing.

- **Citizens and communities**

Green projects, such as green buildings, renewable energy power plants, wind turbines, afforestation plans, are not just capital injection, but also closely related to local residents, ecology, protozoa, economic development, and so on, in which citizens and local communities also play essential roles. Comparing to rich literature on governments and businesses' actions, there are very little studies on this citizen's participation in green financing (see Zaouati et al., 2015; Vergne, et al., 2015). On the one hand, for having a sustainable life, increasing residents, especially in urban areas, are participating in city renovation projects, expecting to reuse limited resources and maximize their value through a circular economy. For example, as the climate crisis intensifies, extreme weather is becoming frequent, especially people living in cities will feel sweltering due to the 'heat island effect' (see Gartland, 2012). Urban dwellers urge the government to add green space and find ways to cool their cities (Friend of the Earth, 2020). Citizens have also started to improve energy efficiency of their houses, to install renewable energy (e.g., installing solar panels on their roofs) or have electric cars.

On the other hand, not all the new environmental policies are supported by citizens or local communities. For example, the policy of imposing an ecological carbon tax on large trucks has triggered the Red Hat movement (*mouvement des bonnets rouges*) (Loyer & Guyader, 2014). Thousands of truck drivers drove slowly on the highway to block traffic. The protesters also smashed the monitoring gates to show their unwillingness to accept the eco-tax policy. As a result, the policy had to be delayed.

One mission to increase the willingness to pay (WTP) of citizens on new policies or projects is to raise their awareness of environmental challenges and the importance of sustainable development. WTP of citizens has a determining role in accepting new environmental economic tools (Gupta, 2016; Rotaris & Danielis, 2019) and represents the maximum amount a citizen deliberates to offer for one good or service (Hanemann,

1991; Horowitz & McConnell, 2003). Public support for WTP policies rises with several factors, such as income (Elliott, Regens & Seldon, 1995), level of education (Sola, 2014), the media's influence (Elliott et al., 1995; Mavrodieva et al., 2019) and public awareness (Arcuri, 1990; Elliott et al., 1995; Fairbrother, 2016). The methods to increase public awareness of environmental problems could be incorporated in school curricula and the use of press media. Environmental policies are more likely to be adopted in countries where people perceive ecological problems to a higher degree since increased knowledge could change the attitudes of individuals (Arcuri, 1990).

Meanwhile, even citizen have high awareness of environmental problem, it does not mean that they would accept the new policies. A common belief is that environmental programs need to be funded, and often underfunded, but in some situation, some funded projects could not be implanted because of the opposition from residents. In many cases, even green facilities, such as renewable energy plants and green buildings, are not welcomed by the local communities. For instance, in France, many villagers are opposed to setting up wind power nearby, thinking that these facilities produce little electricity but damage the ecological system (killing birds for example), produce noise pollution, disfigure the landscape, and cause danger to life (for example, explosion, lightning strike, etc.) (La Nouvelle République,16/12/2020; TF1, 18/06/2020). As a result, wind farm projects are often the subject of disputes, particularly at the legal and political levels.

A good example to show the unwelcomeness of new green constructions in a community is the construction of the 2024 Paris media Village. The French government, co-organized with several companies, claims that the 2024 Paris Olympics will be the most environmentally friendly and sustainable "Eco-Olympic Games" in history. However, since the start of construction at the end of 2020, several citizens and environmental groups gathered in the Aire des Vents in Dugny, 93 provinces north of Paris, to protest the construction of the media Village. The main reason is that the new project will occupy a large part of the park's green space. Opposition groups say the land has been used for decades by residents for leisure, sports, and festivals. After the park is transformed into the Olympic media village, the green space will be cut out and concrete buildings will be built one after another. The

local people may lose their leisure places, and it will also cause harm to ecology and biodiversity (France Bleu, 05/02/2021; Les Echos, 12/01/2021; L'Equipe, 02/10/2020).

As presented, most research on this topic focus on the top-to-down process of green finance, with which the authority (governments, international institutions, etc.) and financial sectors (banks, investment companies, insurance companies, etc.) raise funds for environmental projects. Nevertheless, research on how citizen and local communities accept green projects and participate in green finance is still little.

Conclusion

This working paper presented the key elements in green finance and highlighted the building and building construction sectors. It demonstrated how green finance has been defined at international, regional, and national levels. It also introduced the existing literature in this domain, most employed financial instruments, and the implementation in France by public and private actors. To better explain the situation, some cases of green finance in building and building construction sectors are also demonstrated. One major contribution of this paper is to provide some research perspectives, on the articulation between the logics of green finance and the current implementations.

As mentioned in the introduction, this document is just a prologue for the following research. The next step is to produce a paper with a theoretical dimension and empirical studies of urban building and building construction projects. The preparing article is about how green finance functions in building constructions and will provide a different perspective from the existing studies.

This working paper showed that most existing studies and reports focus on macro level and believe that there is a huge funding gap of green projects. In contrast, our further research will present a very different story. That is, in the building and building construction sectors, many cases show there are sufficient funds looking for good projects to invest in. Put differently, different from the traditional thought that projects

chase funds, our coming research will argue that, in many situations, it is the money from green finance that searches for good projects to invest in.

As mentioned, not all the green constructions are welcomed and accepted by the local communities. One key element to successful conduction green investment projects is the willingness of local communities and citizen. As shown, there is still little literature on how citizen reaction and participant in green investment. Meanwhile, in many cases, green financing also passes by a bottom-up decision-making process, in which the local communities, interest groups, and citizens have the determining power for the implementation of environmental projects.

Our future research will put more focus on the national level and take France as an object to studies to see how the French green bonds and green fund flow into the investments of building and building construction sectors. It will show how local communities interact with the government and the enterprises (construction companies). The goal is to show a bottom-up decision-making process, which is very different from the top-down process that we used to believe, in green finance of building and building construction sectors.

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