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"Financing Sustainability Across the Atlantic: a Green Bond Perspective"

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Chapter 1: Green Bonds and Sustainable Finance

1.1 Introduction: Definition and Characteristics of Green Bonds

In this paper, my bachelor's thesis, I will analyze the phenomenon of green bonds, focusing particularly on the case of CDP in Italy and then delving into the dynamics that make up the green emissions chessboard in the USA, comparing the Trump and Biden governments.

Green Bonds are debt securities that are quite similar to traditional bonds, but with one key difference: the capital raised through their issuance is earmarked exclusively for financing (or refinancing) projects with a positive environmental impact. In other words, the issuer pledges to use the bond proceeds for 'green' initiatives - e.g. renewable energy plants, energy efficiency projects, reforestation, sustainable transport infrastructure, water and waste management, biodiversity protection, eco-friendly construction, and so on. For the rest, a green bond functions like a normal bond: it periodically pays interest (coupons) and repays the principal at maturity, with a financial risk profile similar to that of a non-green bond from the same issuer. Indeed, the creditworthiness and soundness of the issuer remain the determining factors for the bond's repayment capacity, beyond the specific destination of the funds raised.

Given the targeted nature of these instruments, criteria and guidelines have been developed to ensure that a bond can indeed be called a *green bond*. Initially, there was a lack of an unambiguous global standard to certify a bond as 'green'; however, as early as 2014-2015, the financial community adopted voluntary market principles, the Green Bond Principles (GBP) promoted by the International Capital Market Association (ICMA). The GBP outline four key components that characterise a green bond: (1) the use of proceeds in projects clearly identified as environmentally sustainable; (2) a transparent process of evaluation and selection of funded projects, based on pre-defined eligible categories; (3) strict management of the funds raised, keeping them separate and traceable to the issuer's other resources; and (4) a commitment to provide periodic reporting to

investors on the use of proceeds and the environmental impact of the projects funded[1]. These guidelines are voluntary, but their adoption has become common practice to lend credibility to green emissions. The aim is to provide investors with transparency and accurate information, strengthening the integrity of the green bond market through disclosure of these key features. In practice, the issuer of a green bond typically publishes a *framework* or disclosure document detailing the allocation of funds and alignment with the principles, and often employs an independent external review (e.g. a third-party opinion or certification) to attest to the 'green' consistency of the transaction.

In terms of financial characteristics, a green bond does not differ structurally from an ordinary bond: it can be issued in various forms (fixed-rate, variable-rate, structured, etc.), with various maturities and currencies, and traded on secondary markets. What makes it 'green' is therefore the earmarking of the proceeds. This 'earmarking' approach has also introduced new practices into the market: for instance, issuers, especially sovereigns, have developed impact reporting methods to report how the funds raised are contributing to environmental benefits, and fund tracking procedures to ensure their use is consistent with their commitments. It should be noted that green bonds can be issued by a variety of entities: initially, the pioneers were the large supranational institutions (the World Bank, the EIB - European Investment Bank - and other development banks), but subsequently private companies, banks, local authorities and sovereign states have also actively entered this market. Today, therefore, there is a wide range of green bond issuers, from supranationals and government agencies to industrial companies and utilities, including municipalities and regions, reflecting the versatility of the instrument.[2]

1.2 Evolution of the Global Green Bond Market

The green bond market has little more than three decades of history, but has already shown impressive development. The first ever issue dates back to 2007, when the European Investment

[1] Borsa Italiana. (n.d.). *Cosa sono i Green Bond - Borsa Italiana*. https://www.borsaitaliana.it/notizie/sotto-la-lente/green-bond-definizione.htm#:~:text=I%20princ%C3%ACpi%20ICMA%20sono%20quattro%3A,in%20un%20elenco%20di%20categorie

[2] Borsa Italiana. (n.d.-b). *Cosa sono i Green Bond - Borsa Italiana*. https://www.borsaitaliana.it/notizie/sotto-la-lente/green-bond-definizione.htm#:~:text=Inizialmente%20le%20nuove%20obbligazioni%20provenivano,aziende%2C%20municipalit%C3%A0%20e%20agenzie%20statali

Bank placed the first "Climate Awareness Bond", effectively inaugurating this type of financial instrument. The World Bank followed in 2008 with its own green bond, and in the first few years, issues remained concentrated in the hands of a few supranational issuers. From the mid-2010s onwards, however, there has been a marked acceleration: more and more public and private entities have started issuing green bonds all over the world, also driven by the growing global attention to climate change and international agreements.[3] A key moment was 2015, the year of the Paris Climate Agreement[4], after which sustainable finance - and green bonds in particular - received a strong boost. From 2016 onwards, the market saw a broadening of the issuer base: energy *utilities* and industrial companies began raising capital through green bonds to finance the ecological transition, while in December 2016 Poland became the first sovereign state to issue a government green bond, paving the way for many other governments. In the following years, more than 20 countries - including France, the Netherlands, Germany, Chile, up to Italy - have issued sovereign green bonds, demonstrating public interest in this instrument[5]. In Italy, for example, the Ministry of Economy and Finance launched the BTP Green in 2021, with the aim of financing government expenditure with a positive environmental impact (in line with the UN's 2030 Sustainable Development Goals).[6]

Parallel to the increase in the number of issuers, the size of the market in terms of volume soared. From 2015 to 2024, the total amount of outstanding green bonds rose from still modest values (around USD 500 billion in 2018) to almost USD 3 trillion in 2024. In other words, in less than a decade the market has grown almost sixfold, a sign of an increasingly mainstream adoption of green bonds globally. In 2024 alone, new global green bond issuances reached $700 billion, an all-time high, although this amount still represents a relatively small fraction (about one-third) of the estimated annual investments needed to address the climate challenge. From a niche market, green

[3] *Obbligazioni sostenibili*. (n.d.). L'economia per Tutti. https://economiapertutti.bancaditalia.it/aree-tematiche/risparmio-e-investimenti/le-obbligazioni-sostenibili/index.html?dotcache=refresh

[4] The Paris Agreement is a legally binding international treaty on climate change. It was adopted by 195 Parties at the UN Climate Change Conference (COP21) in Paris, France, on 12 December 2015. It entered into force on 4 November 2016. Its overarching goal is to hold "the increase in the global average temperature to well below 2°C above pre-industrial levels" and pursue efforts "to limit the temperature increase to 1.5°C above pre-industrial levels."

[5] *How sovereigns have changed the Green-Bond Market | MSCI*. (n.d.). https://www.msci.com/research-and-insights/blog-post/how-sovereigns-have-changed-the-green-bond-market

[6] The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership.

bonds have thus become a significant component of the international bond landscape, although they remain a minority share of the total bonds issued worldwide for the time being.[7]

It is interesting to observe the geography and composition of this growth. Advanced countries have been the driving force so far: Eurozone members together with the United States account for about half of the value of green bonds currently in circulation. Europe, in particular, has established itself as a reference hub, with major issuers such as the European Union itself (which through the NextGenerationEU[8] programme has become one of the world's largest placements of green bonds), the EIB and public banks such as Germany's KfW. Among the emerging countries, China stands out, which has contributed significantly to the supply of green bonds in recent years, becoming one of the largest markets globally. For example, as early as 2016, China had issued green bonds amounting to around USD 30 billion[9] (summing up issues by banks, local authorities and large corporations), and the number has grown exponentially since then. Overall, active issuers today include a wide variety of players: national and local governments, supranational agencies, financial institutions (banks, insurance companies), listed and unlisted companies, down to small entities and utilities. Particularly significant in recent times has been the growth in issuance by corporate companies operating in emission-intensive sectors (energy, transport, industry), a sign that even the most impactful companies are using green bonds as a means to finance their green transition.[10]

However, the growth path has not been completely linear: there have been phases of slowdown and subsequent acceleration linked to the macroeconomic environment. For example, in 2022 the growth rate of new issuance stagnated compared to previous years. Ronald Van Steenweghen, fixed income manager at DPAM, attributes this stagnation mainly to the rapid rise in interest rates during

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[7] *Growth of the green bond market and greenhouse gas emissions*. (n.d.). https://www.bis.org/publ/qtrpdf/r_qt2503d.htm#:~:text=provides%20stylised%20facts%20about%20the,10%20On%20

[8] NextGenerationEU is a groundbreaking temporary recovery instrument to support Europe's economic recovery from the coronavirus pandemic and build a greener, more digital and more resilient future.
Based on Member State requests for funding under the Recovery and Resilience Facility and the funding needs of other EU programmes supported by NextGenerationEU, the EU expects to raise up to €712 billion (out of a maximum programme envelope of €806.9 billion) by 2026.

[9] Borsa Italiana. (n.d.-c). *Cosa sono i Green Bond - Borsa Italiana*. https://www.borsaitaliana.it/notizie/sotto-la-lente/green-bond-definizione.htm#:~:text=primo%20punto%2C%20possiamo%20citare%20un,i%20trend%20portano%20ad%20una

[10] *Growth of the green bond market and greenhouse gas emissions*. (n.d.-b). https://www.bis.org/publ/qtrpdf/r_qt2503d.htm#:~:text=municipalities%2C%20financial%20institutions%20and%20non,2024%29%20show%20that%20non

that period, which made it more expensive to issue debt in general, rather than to a decline in commitment to green finance. Already in 2023, however, the momentum has turned positive: the first six months of 2023 saw global volumes recover strongly and 2024 is expected to be a record year, with issuance levels exceeding initial expectations[11]. This resilience indicates that demand for sustainable financial instruments remains high and that the green bond market is becoming increasingly mature and integrated into global financial mechanisms.

1.3 Benefits and Criticalities of Green Bonds

As an innovative sustainability-oriented financial instrument, green bonds have a number of potential benefits, but also some critical issues and challenges that should be considered.

Benefits and advantages: First of all, the most obvious benefit of green bonds is that they allow substantial private capital to be channelled into environmental projects, helping to bridge the financing gap needed for the green transition. Through green bonds, governments and companies can raise funds dedicated to green infrastructure, renewable energy, climate adaptation and other sustainable initiatives, mobilising the bond market to support public interest objectives. This represents a concrete response to the growing demand for sustainable investments: the rise of ESG (*Environmental, Social and Governance*) investments in the asset management industry reflects precisely investors' interest in financial instruments that have real positive impacts. Green bonds offer such investors a clear vehicle to commit their funds to environmentally validated projects, without abandoning the traditional financial principles of risk and return.[12]

From an issuer's perspective, issuing a green bond can bring several strategic advantages. First, the issuer signals to the market its commitment to environmental sustainability, enhancing its *green* reputation both among the external public and within the organisation. This can improve corporate image and relations with stakeholders, in an era when environmental responsibility is increasingly

[11] Redazione. (2024, December 10). *Green bond: mercato atteso ancora in crescita ma la normativa non aiuta*. Bluerating.com. https://www.bluerating.com/mercati/826932/green-bond-mercato-atteso-ancora-in-crescita-ma-la-normativa-non-aiuta

[12] *Growth of the green bond market and greenhouse gas emissions*. (n.d.-b). https://www.bis.org/publ/qtrpdf/r_qt2503d.htm#:~:text=municipalities%2C%20financial%20institutions%20and%20non,2024%29%20show%20that%20non

valued. Second, green bonds tend to broaden and diversify the investor base: they attract the interest of ethical funds, ESG funds and institutional investors with sustainability mandates, who may not be interested in traditional bonds from the same issuer. This larger investor base can translate into higher demand for the issue, often with very large and oversubscribed order books. In some cases, this has resulted in a slight borrowing cost advantage for issuers: high demand may allow the bond to be placed at slightly lower yields than an equivalent non-green bond. This differential, commonly referred to as the *greenium* (green premium), has been observed in several placements - investors accept a lower yield in exchange for expected environmental benefits - although its average size has been rather small and variable. As the market has matured, however, greenium has declined to almost disappear at the aggregate level, indicating that green bonds are now priced very similarly to conventional bonds. This indicates an increasing integration of green bonds into conventional portfolios, without yield penalties for investors and without excessive discounts for issuers, reflecting the market's increased confidence in this instrument.[13]

For investors, green bonds also offer specific benefits. They make it possible to *combine financial objectives and environmental values*: an investor in green bonds can obtain a coupon flow and capital security similar to that of a normal corporate or government bond, while knowing that his or her money is tied to environmentally sustainable projects. In terms of risk-return profile, green bonds do not require any particular sacrifice compared to other bonds of the same issuer, since as mentioned, the credit risk depends on the issuer and not on the 'green' nature of the financed project. They are therefore instruments that facilitate the integration of ESG criteria into bond portfolios without drastically altering their financial characteristics. Furthermore, for some institutional investors with sustainability objectives (such as pension funds, insurance companies or central banks), green bonds represent opportunities to align investments with public climate commitments. For istance, it is known that some central banks (in the context of foreign exchange reserve management) have added environmental sustainability among their investment criteria, favouring high-quality 'green' government bonds where available.[14] In general, the emergence of *green* indices, dedicated funds and green bond purchase programmes (such as the ECB's) has given

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[13] Redazione. (2024, December 10). *Green bond: mercato atteso ancora in crescita ma la normativa non aiuta*. Bluerating.com. https://www.bluerating.com/mercati/826932/green-bond-mercato-atteso-ancora-in-crescita-ma-la-normativa-non-aiuta

[14] *Growth of the green bond market and greenhouse gas emissions*. (n.d.-c). https://www.bis.org/publ/qtrpdf/r_qt2503d.htm#:~:text=investment%20needed%20to%20tackle%20climate,financial%20institutions%20and%20private%20corporations

institutional investors the opportunity to participate in the green transition while maintaining liquid and well-diversified portfolios.

Critical problems and challenges: While there are benefits, there are also several critical issues and potential limitations of green bonds, often highlighted by both academic and regulatory debate. One of the most discussed points is the risk of greenwashing. Because the 'green' label adds appeal to a segment of investors, there is a danger that some issuers may use it opportunistically, presenting as sustainable projects or activities that in reality have dubious or marginal environmental benefits. In the past, the lack of an unambiguous definition of 'green investment' has exacerbated this risk, leaving considerable room for interpretation as to which projects might qualify for a green bond. For example, in some contexts, cases of bonds labelled green were seen to finance efficiency improvements in coal-fired power plants or questionable projects, raising skepticism in the ESG community. This problem was recognised and prompted the adoption of such standards and guidelines: first the ICMA Principles and, more recently, public regulations such as the European Green Bond Standard aim precisely to reduce the risk of greenwashing by imposing clearer and more stringent criteria. As of 2023, the European Union has defined a voluntary standard for 'European Green Bonds' (EuGBs) that includes: alignment of funded projects with the EU Green Taxonomy, transparency requirements on issuance characteristics and use of proceeds, annual reporting until the funds are fully used, and independent verification by external auditors. Although adherence to these standards is on a voluntary basis, their existence provides a common frame of reference and increases investor confidence, as an issuer who chooses to follow these rules provides greater assurance that the bond is truly sustainable.[15]

Another critical issue is that green bonds, as such, do not directly guarantee a reduction in emissions or an improvement in the issuer's environmental performance. Unlike, for example, *sustainability-linked* bonds (in which the cost for the issuer may increase if it does not reach certain sustainability targets), traditional green bonds do not include penalties or binding obligations on environmental performance: they ensure that funds go to certain projects, but do not require the company to reduce its overall impact. Initial studies had pointed out that, at least until 2018, green bond issuance provided little information on a company's greenhouse gas emissions performance, as many issuers continued on trajectories that were not aligned with climate targets despite having launched green

[15] *Obbligazioni sostenibili*. (n.d.-b). L'economia per Tutti. https://economiapertutti.bancaditalia.it/aree-tematiche/risparmio-e-investimenti/le-obbligazioni-sostenibili/index.html#:~:text=In%20entrambi%20i%20casi%20si,strumenti%20finanziari%20che%20vuoi%20acquistare

bonds. In other words, it was feared that the green bond could be more about image than substance if not embedded in a broader corporate strategy. However, more recent research suggests a more encouraging picture: the issuance of a green bond by a company is often followed by improvements in the issuer's environmental metrics, such as a reduction in carbon intensity or absolute emissions in the medium term. In particular, the effect is significant for companies in emission-intensive sectors: the launch of a green bond in these cases seems to *signal* a more serious commitment to sustainability, accompanied by additional green investments and a step change in the company's operating practices. This indicates that, while green bonds have no compelling clauses, they can indirectly incentivise more virtuous behaviour (*self-selection* effect and *signalling effect*). In any case, transparency is crucial: only with a solid reporting system on environmental impact, nowadays increasingly widespread, can investors assess the actual contribution of a green bond and prevent the risk of greenwashing.[16]

There are also market aspects to consider among the critical issues. One of these is liquidity: especially in the early years, many green bonds were relatively small and thinly traded issues, which could result in less liquidity in the secondary market than conventional bonds of the same characteristics. Lower liquidity can translate into higher transaction costs for investors and lower pricing efficiency. As the average size of issues has increased and sovereigns (whose bonds typically have large amounts and more liquid markets) have entered the market, this problem has alleviated somewhat, but it remains important that the market continues to grow in depth and trade to ensure that institutional investors can move easily. Another challenge is the heterogeneity of standards globally: while Europe pushes for stringent and homogenous rules (taxonomy, EU standards), other contexts adopt different approaches. The lack of international harmonisation could lead to market fragmentation, creating confusion and higher compliance costs for multinational issuers. For example, a 'green' bond according to Chinese criteria might not be 'green' according to European ones, and vice versa, generating uncertainty as to what is actually being financed. This regulatory inconsistency has been cited by practitioners as a potential factor in 'ESG fatigue' - a sense of fatigue or disillusionment with ESG issues on the part of some investors - which could weaken enthusiasm for financing a low-emission economy. To avoid this, it is considered essential to work towards clear and comprehensive standards, preferably widely recognised, so as to maintain the momentum of sustainable finance.[17]

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[16] *Growth of the green bond market and greenhouse gas emissions*. (n.d.-c). https://www.bis.org/publ/qtrpdf/r_qt2503d.htm#:~:text=investment%20needed%20to%20tackle%20climate,financial%20institutions%20and%20private%20corporations

Finally, a critical element to be emphasised is that, despite exponential growth, the current volume of green bonds is still insufficient compared to the investment needs related to the ecological transition. As mentioned, annual global issuance (around $700 billion in 2024) covers only a fraction of the estimated resources needed each year to mitigate climate change, resources that the International Monetary Fund and other bodies quantify at several trillion dollars per year.[18] Green bonds should therefore be seen as a complementary tool within a much broader effort: on their own they cannot solve the problem, but integrated with public policies, traditional private investments and other sustainable financial instruments (such as social bonds, sustainability bonds, sustainability-linked bonds, etc.) they help to bridge the financing gap and direct capital to where it is most needed. In sum, the challenge for the future is scale and impact: to further grow the green bond market while maintaining its credibility and ensuring that the projects financed actually have measurable environmental impacts that are aligned with global sustainability goals.

1.4 Impact of Green Bonds on Sustainable Finance

The emergence of green bonds in recent years has had a significant impact on the broader sustainable finance movement. Sustainable finance refers to the area of finance that consciously directs capital flows towards sustainable development projects, integrating environmental and social considerations into investment decisions. This approach, initially a niche, has expanded rapidly, especially following the 2015 Paris Conference and the United Nations' Agenda 2030. In this context, green bonds have proved to be a pioneering and driving tool; they have demonstrated that it is possible to link climate objectives with traditional capital markets, creating dedicated financial assets with which investors large and small can participate in the ecological transition.

One of the most obvious impacts is that green bonds have helped mainstream sustainable finance, taking it out of the ethical or niche arena and into the global bond market arena. Today, green bonds are included in many institutional investors' portfolios, in bond benchmarks (there are dedicated

[17] Redazione. (2024, December 10). *Green bond: mercato atteso ancora in crescita ma la normativa non aiuta*. Bluerating.com. https://www.bluerating.com/mercati/826932/green-bond-mercato-atteso-ancora-in-crescita-ma-la-normativa-non-aiuta

[18] *Growth of the green bond market and greenhouse gas emissions*. (n.d.-d). https://www.bis.org/publ/qtrpdf/r_qt2503d.htm#:~:text=provides%20stylised%20facts%20about%20the,10%20On%20the

indices, but even aggregate indices are beginning to include a significant share of green bonds) and even in central bank strategies. As shown, the outstanding value of green bonds has reached approximately $3 trillion by 2024: an amount that, while still representing a small percentage of the overall bond market, clearly indicates that environmental considerations have entered into large-scale investment decisions.[19] The fact that *greenium* has substantially shrunk and that traditional investors buy green bonds without demanding extra yield is a further sign of the normalisation of these instruments. In practice, the distinction between traditional and 'green' finance is blurring: green bonds have acted as a bridge between these two worlds, showing that financial and sustainability objectives can coexist in the same product without being mutually exclusive.

Green bonds have also stimulated the emergence of a whole ecosystem of standards, metrics and products in sustainable finance. The need to define what is 'green' has led, for example, to the development of the EU Taxonomy of Environmentally Sustainable Assets, which provides a normative reference on which projects can be considered compatible with the Union's climate and environmental objectives. This taxonomy has become a pillar of the European sustainable finance strategy, and the new voluntary standard EU Green Bond (EuGB) is a direct application of it, requiring that European green bond proceeds finance activities aligned with the taxonomy. At the global level, the green bond experience has also fostered convergence: institutions such as ICMA have extended the principles from green bonds to social bonds and sustainability bonds, creating a set of guidelines (Social Bond Principles (SBP) and Sustainability-linked Bond Principles (SBG)) covering different spheres of sustainability. In other words, the concept inaugurated by green bonds - using the capital market for specific sustainability goals - has been replicated and extended to other areas (social, combined environmental-social, linked to sustainability targets, etc.), enriching the arsenal of instruments available to sustainable finance. This has enabled increasing specialisation: investors can choose to invest in thematic bonds that reflect their impact objectives, while issuers can tap into new financing channels for projects that would otherwise have had less visibility or financial appeal.[20]

A tangible impact of green bonds on sustainable finance can also be observed in public investment policies. A notable example is the European Union's NextGenerationEU (NGEU) programme, which has provided for the massive issuance of green bonds to finance part of the post-pandemic

[19] *Growth of the green bond market and greenhouse gas emissions*. (n.d.-d). https://www.bis.org/publ/qtrpdf/r_qt2503d.htm#:~:text=provides%20stylised%20facts%20about%20the,10%20On%20the

[20] *Obbligazioni sostenibili*. (n.d.). L'economia per Tutti. https://economiapertutti.bancaditalia.it/aree-tematiche/risparmio-e-investimenti/le-obbligazioni-sostenibili/index.html?dotcache=refresh

recovery fund for green projects. In just over two years since the inaugural issuance in 2021, the EU has placed around EUR 50 billion in NGEU Green Bonds, with the aim of increasing this to EUR 250 billion in the coming years, making it the largest green bond programme in the world. These funds are supporting investments in National Recovery and Resilience Plans (NRPs) in areas such as clean transport, renewable energy, energy efficiency of buildings, environmental protection and research. The quantification of the impact of these investments, presented in a report by the European Commission, indicates that they could result in an annual reduction of 44 million tonnes of CO_2 (about 1.2 per cent of the EU's aggregate annual emissions) thanks to the projects financed by the NGEU green bonds. This example perfectly illustrates the impact of green bonds: on the one hand *they enable* states and supranational institutions to raise capital at a sustainable cost for ambitious climate policies, and on the other *they offer investors concrete feedback* on the use of their funds. As European Budget Commissioner Johannes Hahn said, the real 'return' for investors who subscribe to EU green bonds lies in the measurement of the environmental impact achieved, that is, in the knowledge that they have contributed to a greener future for the next generation. In essence, transactions like the EU's strengthen confidence in sustainable finance, demonstrating that financial instruments can have measurable results in terms of sustainability and not just an economic return.[21]

From a cultural and market perspective, the existence of green bonds has forced issuers and investors to develop more ESG reporting skills and practices. Companies and governments issuing green bonds have had to equip themselves with internal structures to select projects, monitor their implementation and measure their environmental impact over time. This has led to the spread of sustainability *frameworks*, the adoption of environmental KPIs and the publication of annual impact reports - elements that are expanding in practice even beyond the green bonds themselves, influencing, for example, traditional financial reporting with the inclusion of ESG sections. On the investor side, the growth of green bonds has stimulated the development of more sophisticated environmental analysis and ratings: rating agencies and specialised providers now assess not only the credit riskiness, but also the 'green' quality of bonds (e.g. Second Party Opinions, Climate Bond Certification, ESG scores). All this contributes to greater transparency and accountability in the financial market regarding the non-financial impacts of investments.

[21] *UE, investimenti di NextGenerationEU Green Bond riducono emissioni gas serra*. (2023, December 1). Repubblica.it. https://finanza.repubblica.it/Pages/News/Item.aspx?ID=151_2023-12-01_TLB

From my point of view, the impact of green bonds as a laboratory for financial innovation should be emphasised. Their experience has paved the way for other innovative instruments, such as the aforementioned sustainability-linked bonds (linking financial conditions to the achievement of sustainability targets) or transition bonds (bonds intended to finance the ecological transition of high-impact activities, not strictly 'green' as well). Moreover, it has triggered reflections on the role of finance in driving virtuous behaviour: for example, recent study findings indicate that the issuance of green bonds may be correlated with subsequent reductions in corporate emissions, suggesting that finance may incentivise companies and governments to improve their environmental performance. Such findings further encourage investors and policymakers to leverage finance for sustainability goals, believing that aligning finance and the real economy in this direction creates a virtuous circle.

In conclusion, green bonds have had a profoundly positive impact on the development of sustainable finance. They have raised awareness that the capital market can play a key role in financing the fight against climate change and sustainable development goals. They have provided concrete examples of how the environmental impacts of investments can be measured and reported, improving overall transparency. They have attracted a new generation of investors sensitive to ESG issues, prompting financial intermediaries to create products tailored to them. They have pushed issuers to integrate environmental considerations into their long-term financial strategy. While not a panacea, green bonds are now an indispensable tool in the sustainable finance toolbox, and their success is laying the foundations for a more environmentally and socially conscious financial system, in which the creation of economic value increasingly goes hand in hand with the creation of value for society and the planet.

The growing role of green bonds is also reflected in the strategies of national promotional institutions, as we will see in detail in the next chapter with the case of Cassa Depositi e Prestiti.

Chapter 2: The CDP Case

2.1 CDP's role in the Italian economy

Cassa Depositi e Prestiti (CDP) plays a key role in the Italian economy as a national promotional institution, catalysing national savings to stimulate the country's economic and social growth. Controlled by the Ministry of Economy and Finance, CDP's stated mission is to promote Italy's sustainable development by responsibly using public savings to foster economic growth and employment. In concrete terms, its activities range from financing the public administration and strategic infrastructure to supporting businesses (including through the banking system), playing a valuable countercyclical role in times of crisis or 'market failure'. CDP also acts as a long-term investor in projects of national interest and participates in the implementation of key public initiatives, including the National Recovery and Resilience Plan (NRRP).

Sustainability is at the heart of CDP's identity and strategy. *"In line with CDP's historic mission, sustainability is a cornerstone around which we seek to direct all our operations*," said a representative of the group, reiterating the commitment to orient initiatives towards ESG objectives in an increasingly conscious and responsible manner. This focus translates into the explicit integration of the UN Sustainable Development Goals and ESG criteria into the company's business model. In line with its historic mission, CDP therefore uses the financial instruments at its disposal to support inclusive and sustainable growth, investing in innovation, green infrastructure and local development with a long-term perspective.[22]

CDP's commitment to sustainable finance is also evident in its capital raising activities: since 2017, the institution has progressively expanded the range of ESG bonds offered to the market. In particular, before 2023, CDP had already issued eight Social and Sustainability Bonds, dedicated to projects with positive social or socio-environmental impacts. These issuances have helped

[22] *Cdp, sostenibilità al centro per il futuro dell'economia globale*. (n.d.). www.quinewsamiata.it. https://www.quinewsamiata.it/italpress/cdp-sostenibilita-al-centro-per-il-futuro-delleconomia-globale#:~:text=a%20quando%20servono%20i%20milioni,l%E2%80%99iniziativa%20per%20CDP%20sar%C3%A0%20fondamentale

consolidate CDP's role as one of the leading issuers in sustainable finance in Italy, acting as a forerunner for the introduction of Green Bonds, which will be discussed in the following sections.[23]

2.2 CDP's 2023 Green Bond

In February 2023, CDP successfully launched its inaugural Green Bond, marking a further step in the institution's sustainable finance journey. This is the first green bond issued by CDP, designed to raise funds to be used exclusively to finance initiatives with positive environmental impacts. In particular, the proceeds from the bond were allocated to infrastructure investments in the renewable energy, energy and water efficiency, and sustainable mobility sectors. CDP's objective was therefore to support projects capable of contributing to the country's ecological transition, such as clean energy plants, energy and water saving measures, and low-emission transport. In line with this purpose, the transaction was structured within the *CDP Green, Social and Sustainability Bond Framework* (CDP's reference framework for ESG issues) and was found to be aligned with the ICMA (International Capital Market Association) international standards on Sustainability/Green Bonds. To guarantee the soundness and transparency of the issue, CDP obtained an independent Second Party Opinion from ISS ESG, which positively assessed the portfolio of selected 'green' projects.[24]

From a technical and financial point of view, CDP's 2023 Green Bond had the following characteristics: a nominal amount of €500 million, a maturity of 6 years (maturing in 2029) and a fixed gross annual coupon of 3.875%. It is a senior unsecured bond (non-subordinated and unguaranteed), reserved for institutional investors, issued under CDP's Debt Issuance Programme for the international capital market. The market response was extremely positive: demand exceeded supply by five times, with orders for over €2.6 billion from more than 130 investors. Of these, approximately 80% were foreign investors, with strong participation from funds and institutions specialising in ESG investments. This high demand, well above the amount offered, enabled CDP to

[23] *Green Bond Inaugurale 2023*. (n.d.). Cassa Depositi E Prestiti. https://www.cdp.it/sitointernet/it/green_bond_inaugurale_2023.page#:~:text=Questa%20emissione%20conferma%20il%20ruolo,in%20formato%20Social%20e%20Sustainability

[24] *Green Bond Inaugurale 2023*. (n.d.-b). Cassa Depositi E Prestiti. https://www.cdp.it/sitointernet/it/green_bond_inaugurale_2023.page#:~:text=L%E2%80%99emissione%20%C3%A8%20in%20linea%20con,%E2%80%9CLotta%20contro%20il%20cambiamento%20climatico%E2%80%9D

obtain favourable economic conditions and demonstrates the growing market interest in financial instruments linked to sustainability.[25]

On a strategic level, CDP emphasised that this first green bond represents a key step in its evolution as a sustainable issuer. At the launch, it was highlighted that the transaction *"confirms CDP's leading role as an issuer in sustainable finance and further expands the ESG funding instruments offered to the market"*, following the eight Social and Sustainability issues carried out since 2017. In addition to this, CDP wanted to explicitly align the 2023 Green Bond with the UN Sustainable Development Goals (SDGs): the projects financed aim to contribute in particular to goals 6 (*Clean water and sanitation)*, 7 (*Affordable and clean energy)*, 11 (*Sustainable cities and communities)* and 13 (*Climate action)*. This direct link with the SDGs reflects CDP's desire to channel the resources raised towards priority areas for action on the international sustainable agenda.[26]

2.3 Impact and performance of the 2023 emission

A few years after its launch, it is possible to assess its initial impacts and results on various fronts: environmental, financial and reputational.

From an environmental perspective, the projects financed through CDP's 2023 Green Bond are producing tangible, measurable benefits. According to the Green Bond Report published by CDP, the initiatives supported by the proceeds from the issue will contribute to an overall annual reduction of over 56,000 tonnes of CO_2 equivalent. This reduction in emissions is the result of interventions in multiple sectors: for example, the installation of new renewable energy plants with a capacity of approximately 17 MW has led to the avoidance of approximately 9,452 tonnes of CO_2 per year; the energy efficiency measures financed generate an estimated saving of 147,000 MWh/year of energy; in the transport sector, the issue has enabled the purchase of 4,305 low-emission vehicles and the installation of dozens of electric charging points, contributing to more

[25] *Green Bond Inaugurale 2023*. (n.d.-c). Cassa Depositi E Prestiti. https://www.cdp.it/sitointernet/it/green_bond_inaugurale_2023.page#:~:text=L%E2%80%99operazione%20ha%20fatto%20registrare%20ordini,forte%20presenza%20di%20investitori%20ESG

[26] *Green Bond Inaugurale 2023*. (n.d.-d). Cassa Depositi E Prestiti. https://www.cdp.it/sitointernet/it/green_bond_inaugurale_2023.page#:~:text=L%E2%80%99emissione%20%C3%A8%20in%20linea%20con,%E2%80%9CLotta%20contro%20il%20cambiamento%20climatico%E2%80%9D

sustainable mobility. In the circular economy, projects have promoted the recycling of materials and the production of biogas and fuels from waste (over 101,000 tonnes/year of recycled secondary materials and 171,000 cubic meters of biogas produced). These figures, certified by specific impact reporting methodologies and reviewed by external bodies, indicate that the 2023 CDP is effectively channelling resources towards interventions capable of generating concrete environmental benefits in line with the commitments made. Moreover, approximately 31% of the funds were allocated to sustainable mobility projects (e.g., renewal of public transport fleets with low-impact vehicles) and another 25% to sustainable construction projects (construction or renovation of energy-efficient buildings). The remainder was distributed among energy efficiency (25%), water resource protection (9%) and initiatives falling within the categories of renewable energy and the circular economy (10% in total). The diversification of the areas of intervention has made it possible to maximise the overall positive impact, addressing various environmental sustainability challenges (clean energy, green mobility, efficient water and waste management, etc.).[27]

From a financial perspective, the performance of the 2023 Green Bond was equally significant. As previously mentioned, at the time of placement, the issue recorded orders five times the amount offered, signalling strong market confidence. This robust demand meant that, already at pricing, the security was able to benefit from favourable interest rate conditions for CDP; in fact, the coupon of 3.875% reflected the issuer's creditworthiness, but the effective issue yield was compressed thanks to high demand (with a spread tightening compared to the levels initially indicated, according to market analysts). In the secondary market, the bond held up well, with sustained trading volumes on OTC platforms among institutional investors interested in green instruments from issuers with sovereign ratings. In addition, the broad participation of international and specialised ESG investors enabled CDP to diversify its investor base, attracting foreign and long-term capital. This strengthens CDP's financial reputation in global capital markets, demonstrating the institution's ability to successfully place sustainable debt in line with international standards.[28]

From a reputational and strategic point of view, the 2023 bond has strengthened CDP's image as a leading player in national sustainable finance. The launch of a Green Bond, following several social and sustainable issues, has completed CDP's range of ESG products, highlighting a comprehensive and consistent sustainability strategy. Specialised agencies welcomed the transaction: ISS ESG, in

[27] *Green Bond Inaugurale 2023*. (n.d.-d). Cassa Depositi E Prestiti. https://www.cdp.it/sitointernet/it/green_bond_inaugurale_2023.page#:~:text=L%E2%80%99emissione%20%C3%A8%20in%20linea%20con,%E2%80%9CLotta%20contro%20il%20cambiamento%20climatico%E2%80%9D

[28] *Green Bond Inaugurale 2023*. (n.d.-d). Cassa Depositi E Prestiti. https://www.cdp.it/sitointernet/it/green_bond_inaugurale_2023.page#:~:text=L%E2%80%99emissione%20%C3%A8%20in%20linea%20con,%E2%80%9CLotta%20contro%20il%20cambiamento%20climatico%E2%80%9D

addition to providing the initial Second Party Opinion, subsequently confirmed that CDP's impact reporting for the Green Bond is aligned with best market practices and the commitments made in the Framework. This type of external recognition helps to increase CDP's credibility with ESG-conscious investors. Furthermore, the initiative has also generated a favourable image among the public and domestic stakeholders: in the specialised press, the transaction was described as accelerating CDP's commitment to the country's sustainable development. CDP itself highlighted how this bond *'accelerates its commitment to sustainability'* by allocating resources to green initiatives in key sectors for the ecological transition. [29]

Looking at the overall impact and performance, CDP's inaugural Green Bond shows how a well-designed 'green' bond issue can generate a triple positive return: quantifiable environmental impacts (in terms of emissions avoided, energy saved, sustainable infrastructure built), satisfactory financial results (high demand, new sources of financing activated at competitive costs) and reputational/strategic benefits (strengthening of CDP's ESG positioning and investor confidence). These results also provide an important benchmark for CDP's subsequent green transactions and, more generally, for the development of the Italian Green Bond market.

2.4 CDP's 2025 Green Bond issuance

In 2025, CDP returned to the market with a new green issuance, confirming the continuity of its commitment. CDP's 2025 Green Bond, placed in June 2025, is the second green bond launched by the institution and features a number of significant innovations compared to the inaugural issue in 2023. Firstly, the 2025 transaction has a strong technological innovation component: CDP has used *blockchain* technology to 'tokenise' the fund reporting process, making the allocation of proceeds and related impacts traceable on a distributed ledger. As highlighted by CDP itself, this is the first emission in Europe to integrate a blockchain-based reporting system, benefiting the transparency and reliability of the information provided to investors. In this way, CDP aims to increase investor

[29] *Green Bond Inaugurale 2023*. (n.d.-d). Cassa Depositi E Prestiti. https://www.cdp.it/sitointernet/it/green_bond_inaugurale_2023.page#:~:text=L%E2%80%99emissione%20%C3%A8%20in%20linea%20con,%E2%80%9CLotta%20contro%20il%20cambiamento%20climatico%E2%80%9D

confidence in its ESG bonds by offering a cutting-edge tool to verify that the funds raised are actually allocated to *the* declared *Eligible Green Assets*.[30]

In terms of the purpose and allocation of the funds, the 2025 Green Bond follows and expands on the areas already covered in 2023. The proceeds will be used to finance initiatives with a positive environmental impact, in particular: infrastructure investments in renewable energy, sustainable mobility projects (e.g. green public transport, electric charging infrastructure) and measures to support businesses focused on energy efficiency and the circular economy. The key sectors of energy and transport are therefore confirmed, with added emphasis on industrial innovation and the materials cycle (in line with the expansion of eligible categories under CDP's new sustainability framework). Consistent with this, the 2025 issuance has been aligned with a broader set of UN SDGs than the previous one: in addition to SDGs 7 (*Affordable and clean energy)*, 11 (*Sustainable cities and communities)* and 13 (*Climate action)*, which are common to the 2023 bond, it also refers to SDG 9 (*Industry, innovation and infrastructure)* and SDG 12 (*Responsible consumption and production)*, highlighting the expected impact on industrial innovation and the circular economy.[31]

In terms of technical characteristics, CDP's 2025 Green Bond has a nominal amount of €500 million, in line with the size of the first bond, but a longer maturity of 8 years (maturing in 2033). The fixed annual coupon is 3.250%, slightly lower than that of the 2023 bond, also reflecting market and interest rate conditions in 2025. The bond was also issued under CDP's EMTN programme for institutional investors, but with the distinction of being the first CDP bond listed on the domestic market: the security made its debut on the Mercato Telematico delle Obbligazioni (MOT) of Borsa Italiana, marking the first listing on the Italian stock exchange of a bond reserved for CDP institutional investors. This has a twofold significance: on the one hand, it increases the visibility of the transaction in Italy, and on the other, it confirms CDP's commitment to developing the local sustainable capital market.[32]

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[30] *Green Bond 2025*. (n.d.). Cassa Depositi E Prestiti. https://www.cdp.it/sitointernet/it/green_bond_2025.page#:~:text=CDP%20rafforza%20la%20propria%20leadership,di%20rendicontazione%20in%20ambito%20ESG

[31] *Green Bond 2025*. (n.d.). Cassa Depositi E Prestiti. https://www.cdp.it/sitointernet/it/green_bond_2025.page#:~:text=CDP%20rafforza%20la%20propria%20leadership,di%20rendicontazione%20in%20ambito%20ESG

[32] *Green Bond 2025*. (n.d.). Cassa Depositi E Prestiti. https://www.cdp.it/sitointernet/it/green_bond_2025.page#:~:text=CDP%20rafforza%20la%20propria%20leadership,di%20rendicontazione%20in%20ambito%20ESG

The outcome of the placement was once again very positive. The new green emission, carried out on 11 June 2025, attracted orders for approximately €2.5 billion, resulting in oversubscription of five times the amount offered. Over 100 investors participated, with a strong international component: approximately 73% of the final allocation went to foreign investors (particularly from France, Benelux, the UK and Germany). This confirms the strong foreign interest in CDP's ESG emissions, reflecting the credibility enjoyed by the entity on the global market.[33]

CDP's 2025 Green Bond is also the first to be issued under the *CDP Green, Social and Sustainability Bond Framework* updated in December 2023. This renewed framework incorporates the latest developments in the ICMA Green Bond Principles and the EU Taxonomy criteria, strengthening the alignment of CDP issues with international best practices. The update of the framework has made it possible to expand the categories of eligible projects (as seen, for example, by more explicitly including the circular economy and innovative infrastructure) and to refine reporting and transparency commitments. The *Second Party Opinion* associated with the new framework, also issued by an independent body, confirmed compliance with ICMA standards and the robustness of the ESG criteria adopted by CDP.[34]

With this transaction, CDP *"reaffirms its leadership role in sustainable finance"*, bringing to eleven the total number of ESG (Green, Social, Sustainability) issues launched since 2017, for a total value of approximately €7.25 billion raised. This is a significant volume, which demonstrates CDP's ability to mobilise substantial resources in support of the country's sustainable development objectives. The 2025 bond, in particular, is one of the initiatives supporting the priorities outlined in CDP's 2025-2027 Strategic Plan, with an emphasis on “Just Transition” (supporting infrastructure for the energy transition and circular economy projects) and on the competitiveness of the country's economy, strengthening the ecosystem of businesses and administrations through access to financing for growth and technological innovation.[35]

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[33] *Green Bond 2025*. (n.d.). Cassa Depositi E Prestiti. https://www.cdp.it/sitointernet/it/green_bond_2025.page#:~:text=CDP%20rafforza%20la%20propria%20leadership,di%20rendicontazione%20in%20ambito%20ESG

[34] *Green Bond 2025*. (n.d.). Cassa Depositi E Prestiti. https://www.cdp.it/sitointernet/it/green_bond_2025.page#:~:text=CDP%20rafforza%20la%20propria%20leadership,di%20rendicontazione%20in%20ambito%20ESG

[35] *Green Bond 2025*. (n.d.). Cassa Depositi E Prestiti. https://www.cdp.it/sitointernet/it/green_bond_2025.page#:~:text=CDP%20rafforza%20la%20propria%20leadership,di%20rendicontazione%20in%20ambito%20ESG

2.5 Comparison with other Italian companies: Enel, Intesa Sanpaolo and Terna

Although significant, the case of CDP is part of a broader context of growing popularity of Green Bonds in Italy. To better understand the unique features and scope of CDP's experience, it is useful to compare it with the issues of other major Italian players: Enel (electricity sector), Intesa Sanpaolo (banking sector) and Terna (electricity infrastructure). These companies have all launched Green Bonds in recent years, with different objectives, volumes and impacts depending on their sector of activity, but united by the intention to finance the transition to more sustainable models.

I chose to analyze Intesa's bonds because it is one of the most relevant banks in Italy, Enel because it is the most important energy company in Italy and Terna because I dealt with it during my third-year summer internship.

Enel, one of the country's leading energy groups, was among the pioneers in the use of Green Bonds by Italian corporations. Back in January 2017, Enel launched its first Green Bond on the European market, for a total amount of €1.250 billion and with a 7-year maturity (single repayment scheduled for September 2024). This inaugural emission, intended to finance *renewable energy* production projects and the modernisation of electricity grids, marked the debut of an Italian company in the corporate green bond segment and was listed on the Italian Stock Exchange, effectively inaugurating the segment dedicated to green financial instruments on the Piazza Affari. The transaction attracted considerable interest and positioned Enel among the most active European utilities in sustainable finance. In the following years, Enel continued along this path: by the end of 2018, the group had issued a total of three Green Bonds for a total of approximately €3.5 billion. These emissions mainly financed the growth of renewable capacity (wind and solar farms) and energy efficiency measures, contributing to the reduction of the carbon footprint of Enel's production mix. For example, the proceeds were used to build new green plants in various countries and improve the reliability and efficiency of the grid, with an estimated benefit in terms of CO_2 emissions avoided and increased clean energy produced. Enel has further innovated its approach by switching, starting in 2019, to the issuance of Sustainability-Linked Bonds (bonds linked to the achievement of sustainability targets, such as increasing the share of renewables in its portfolio) instead of using exclusively the *use-of-proceeds* format. This evolution marked a difference

compared to CDP: while CDP followed the classic green bond model with specific allocation of funds, Enel paved the way for instruments linked to the issuer's sustainability performance (e.g. providing for a step-up in the coupon if certain decarbonisation targets were not met). Nevertheless, Enel's use-of-proceeds Green Bonds were an important benchmark in the Italian market in the initial phase, both in terms of size (over €1 billion each) and expected impact (the first bond was associated with an estimated reduction in emissions of tens of millions of tonnes of CO_2 avoided over the life of the financed plants, according to Enel's internal reports). In summary, Enel has moved forward with global ambitions, using Green Bonds to finance its energy transition and communicate its commitment to green investments to the market. A comparison with CDP highlights some differences: Enel, being a corporation directly active in renewable generation, has focused its investments on clean energy plants and energy infrastructure, with larger emission volumes (even €1-1.25 billion per tranche) and a very strong international presence; CDP, for its part, acts as a public financial intermediary, distributing funds across various sectors (energy, water, transport, etc.) mainly in Italy, with tranches of €500 million to date. However, both share the same alignment with ICMA principles and the objective of mobilising capital for projects with climate and environmental benefits.[36]

Intesa Sanpaolo, Italy's leading banking group, has distinguished itself as a pioneer in the financial sector: it was the first Italian bank to issue a Green Bond in 2017, for an amount of €500 million. This inaugural emission was intended to finance existing and future loans in the fields of renewable energy and energy efficiency, reflecting the bank's commitment to supporting its corporate customers' transition to more sustainable models. Since then, Intesa Sanpaolo has developed a comprehensive Green, Social and Sustainability Bond Framework, in line with the ICMA Green Bond Principles and the EU Taxonomy, through which it has carried out a series of thematic issues. In total, from 2017 to 2023, Intesa has launched seven Green Bonds, with different denominations and specific destinations, for a total of over €8 billion raised. Among the most significant emissions there are: a €750 million Green Bond in 2019 dedicated exclusively to circular economy projects (a world-first initiative in this area); a €1.25 billion Green Bond in 2021 to finance 'green' mortgages (granted for the construction or purchase of energy-efficient buildings, or renovations with a minimum energy class improvement of two levels); a €1 billion Green Bond in 2022 with a very broad use, covering all green categories included in the new framework updated in June 2022 (renewable energy, energy efficiency, green transport, green buildings, sustainable agriculture, etc.).

[36] *Green bond*. (n.d.). Enel Group | Enel Group. https://www.enel.com/it/investitori/investimenti/finanza-sostenibile/green-bond

Finally, in 2023, Intesa successfully placed a dual tranche bond (two simultaneous tranches) for a total of €2.25 billion, also intended to finance a diversified basket of green projects in line with the framework and the EU Taxonomy. Intesa's strategy therefore appears to be geared towards significant growth in volumes (from €500-750 million to over €2 billion in just a few years) and covering a wide range of environmental issues as the bank expands its portfolio of green loans. With regard to impact, Intesa Sanpaolo publishes an annual *Green Bond Report* on the allocation and environmental performance of its issues. For example, in its 2024 Report, the bank highlights how its green bond funds have financed (up to 2024) projects worth over €8.7 billion, with impact indicators such as megawatts of installed renewable capacity, tonnes of CO_2 avoided and the number of SMEs financed for green interventions. In the social sphere, the bank emphasises that these operations support the ecological transition of the Italian productive fabric and contribute to sustainable and inclusive growth. A comparison with CDP reveals a number of considerations: Intesa, as a commercial bank, uses green bonds mainly to refinance 'green' loans granted to private customers and businesses – thus with widespread impacts on the real economy (efficient home mortgages, loans to businesses for renewable energy plants, etc.) – and has achieved much higher cumulative volumes; CDP, on the other hand, directly invests the proceeds in infrastructure projects or public investments, acting as a catalyst in strategic sectors. However, both institutions adopt rigorous standards (certified frameworks, Second Party Opinions, impact reports) and that guarantee the credibility of the issues and the measurability of the environmental benefits produced.[37]

Terna, the national electricity transmission grid operator, is a particularly interesting case in Italy as it is the first infrastructure company to use Green Bonds to finance its investment activities. Terna made its debut in this field in July 2018 with the issuance of its first Green Bond worth €750 million (5-year maturity, 1% annual coupon). This operation was significant: Terna was the first Transmission System Operator (TSO) in Europe to issue a green bond, highlighting how even network infrastructure, traditionally financed through regulated channels, can find sustainable finance a driver for accelerating the energy transition. The Terna 2018 bond, listed in Luxembourg, raised funds for projects to develop and modernise the electricity grid, with the aim of promoting greater integration of renewable sources and improving the efficiency and security of the electricity system. For example, the proceeds financed new power lines and substations in key areas to connect wind and solar power plants, reducing grid congestion and thus indirect emissions due to system

[37] *Green e Social Bond Report | Intesa Sanpaolo*. (n.d.). Intesa Sanpaolo Group. https://group.intesasanpaolo.com/it/sostenibilita/reporting-di-sostenibilita/green-bond-report#

inefficiencies. In January 2019, Terna increased that initial amount to €1 billion (through an additional tranche of €250 million), and shortly afterwards, in April 2019, it launched a second €500 million Green Bond with a 7-year maturity (April 2026, 1% coupon). This latest issuance was met with extraordinary demand, more than seven times the initial offer, demonstrating investors' appreciation of Terna's solid financial profile combined with the *green* value of the transaction. Overall, in the two-year period 2018-2019, Terna issued three Green Bonds (including a private placement) for a total of €1.5 billion, as part of its €8 billion EMTN programme. In more recent years, the company has continued along this path: for example, in 2021, it placed an additional ten-year green bond worth €600-750 million, continuing to finance network projects for the transition (as reported in its Sustainability Report). In terms of impact, Terna reports the associated environmental benefits in its annual Green Bond Reports: the network upgrade and digitalisation projects financed with green bonds help to reduce energy losses, prevent congestion and blackouts, and enable a higher share of renewable production, with an indirect effect of reducing emissions in the electricity sector. Furthermore, from an economic and social perspective, these infrastructure investments improve the quality of the electricity service and generate industrial spin-offs in terms of supplies and skilled employment. Compared to CDP, Terna's case is different because here the green bond finances 'green' projects within the company (network development capex) and not an external portfolio of loans or equity investments; however, the ultimate goal is the same: to mobilise capital to accelerate the national energy transition. In terms of volume, Terna's green bonds were similar in size to CDP's issues (€500-750 million each), but were part of a highly focused investment plan: suffice it to say that most of the more than €8-10 billion in capex planned in Terna's 2021-2025 business plan is dedicated to resilient and smart infrastructure to accommodate renewable sources. The use of green bonds has enabled Terna to diversify its sources of financing beyond the traditional general purpose bond debt, while signalling to the market its strategic commitment to sustainability and innovation.[38][39]

A comparison between CDP, Enel, Intesa Sanpaolo and Terna in the field of Italian green bonds highlights both similarities and significant differences. On the one hand, all have followed international standards (such as the ICMA principles) and obtained independent ratings, guaranteeing the credibility of their issues. Moreover, each issuer publishes periodic reports on the

[38] TERNA GROUP. (2019). *Green Bond Report 2019*.

[39] TERNA GROUP. (2023). *Annual Report 2023*.

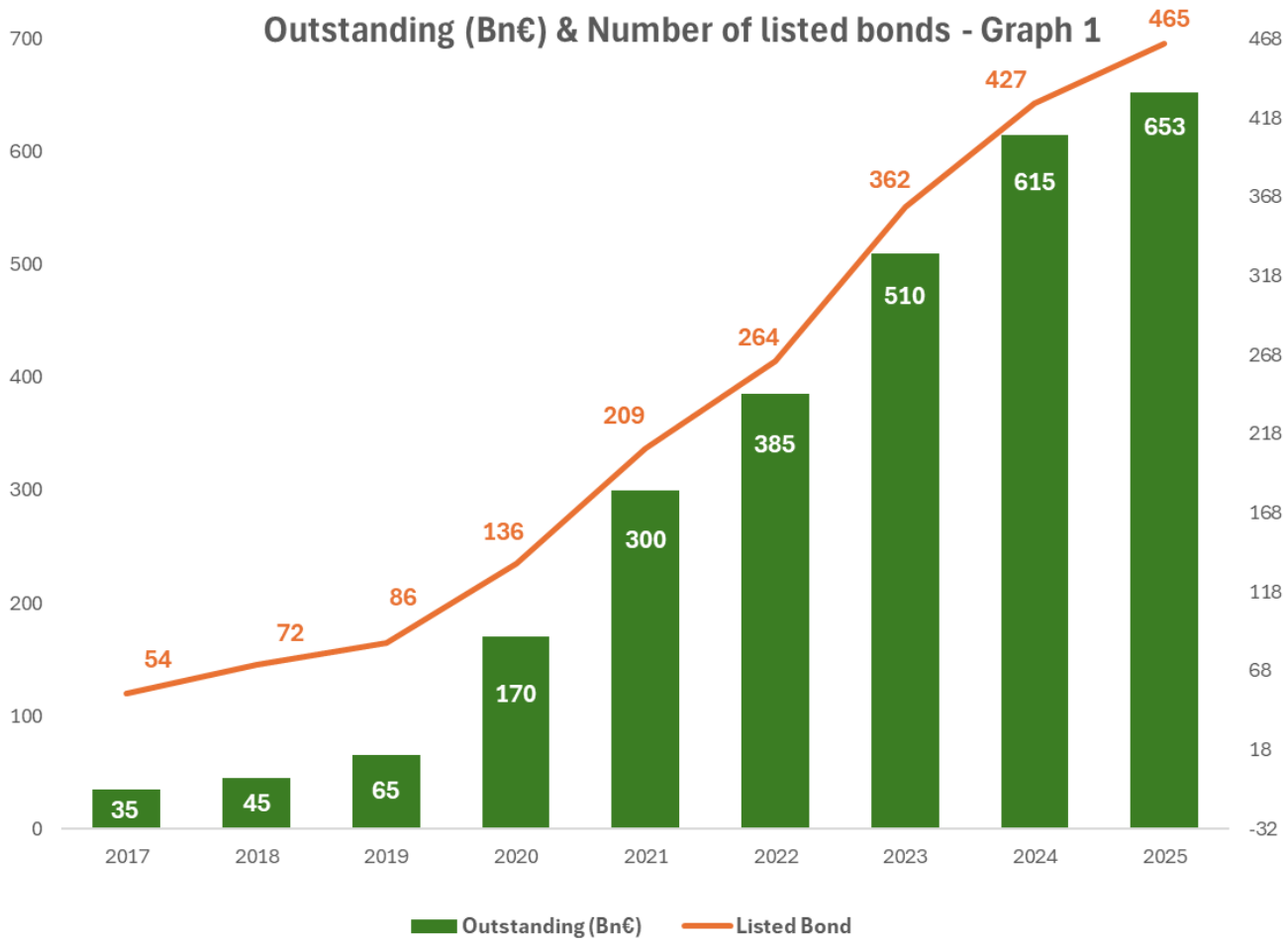
use of proceeds and environmental results achieved (e.g., tonnes of CO_2 avoided or renewable energy produced), ensuring full transparency towards investors and stakeholders.

However, on the other hand, important differences in scale and approach remain. Enel and Intesa Sanpaolo have gradually increased the volume of their emissions to place Green Bonds worth several billion euros, while CDP and Terna have so far remained at more modest levels (around €500-750 million per issue), tailored to their own needs. The allocation of funds also reflects the different nature of the issuers. Enel and Terna invest mainly in energy projects (new renewable energy plants and upgrading of electricity grids), thus contributing to the decarbonisation of the national electricity system. Intesa Sanpaolo uses the resources to support the environmental transition of businesses and individuals in a variety of sectors, from building efficiency to sustainable transport and the circular economy. Finally, CDP channels the capital raised towards public or infrastructure initiatives with widespread environmental benefits across the country.

Hence, the Italian experience shows that Green Bonds are a flexible and increasingly important tool, successfully adopted by both private operators and public institutions to finance projects with low environmental impact. Although they have different approaches linked to their respective missions, they all aim to direct capital towards common sustainability objectives. The widespread interest of investors, including international ones, and the concrete results already observed (new clean energy plants, CO_2 emissions avoided, modernised infrastructure, companies supported in their ecological transition) confirm the validity of this model. Green Bonds are now an important component of the Italian financial market, and the experience gained so far provides a solid basis for further developments towards a more sustainable economy.

Below, you can find some graphs: the first five, made by me using official data from Borsa Italiana[40], regarding the green bonds market in Italy, and the last two compare yield and duration between traditional bonds and green bonds, and they are made by Goldman Sachs[41].

[40] Borsa Italiana (July 2025): Green, Social & Sustainable Bonds: The Market Experience
[41] Goldman Sachs Asset Management, & Bos, B. (2023). OLTRE L'IMPATTO: UN'ANALISI DEI DRIVER DI PERFORMANCE DEI GREEN BOND. In *Goldman Sachs Asset Management* (pp. 2–4).


Outstanding (Bn€) & Number of listed bonds - Graph 1
700
600
500
400
300
200
100
0
468
418
368
318
268
218
168
118
68
18
-32
54
72
86
136
209
264
362
427
465
35
45
65
170
300
385
510
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2017
2018
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2023
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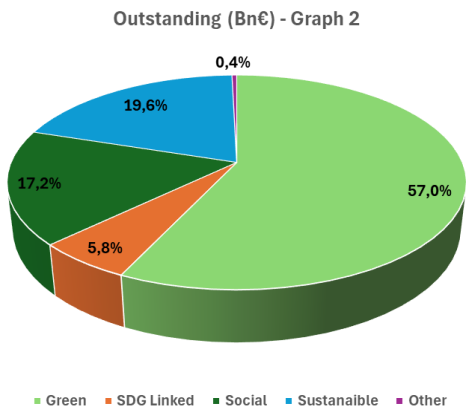
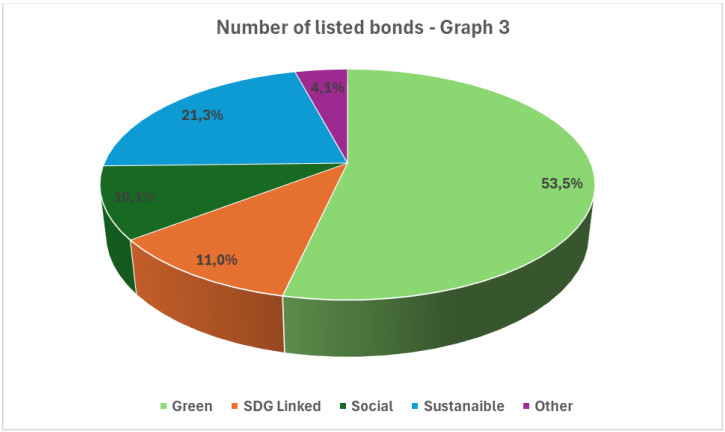
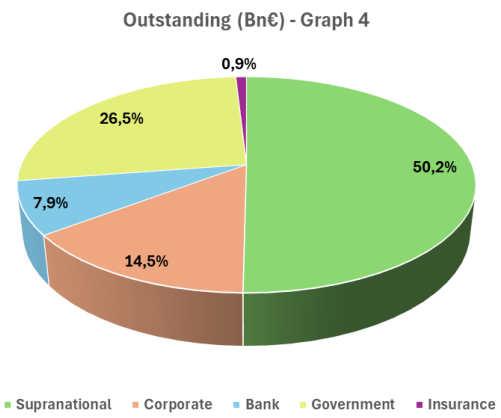
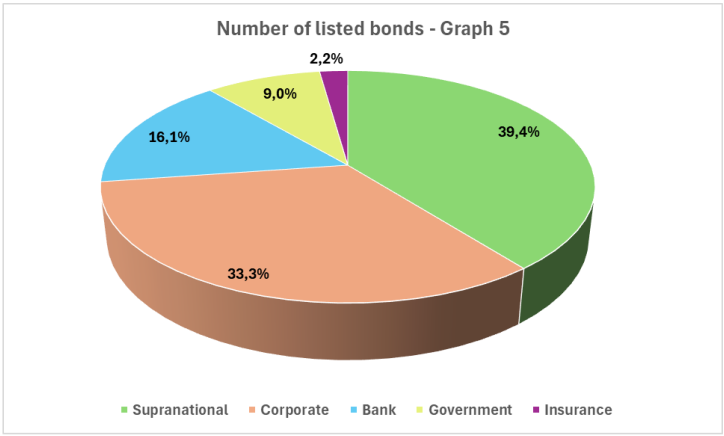
2025
Outstanding (Bn€)
Listed Bond

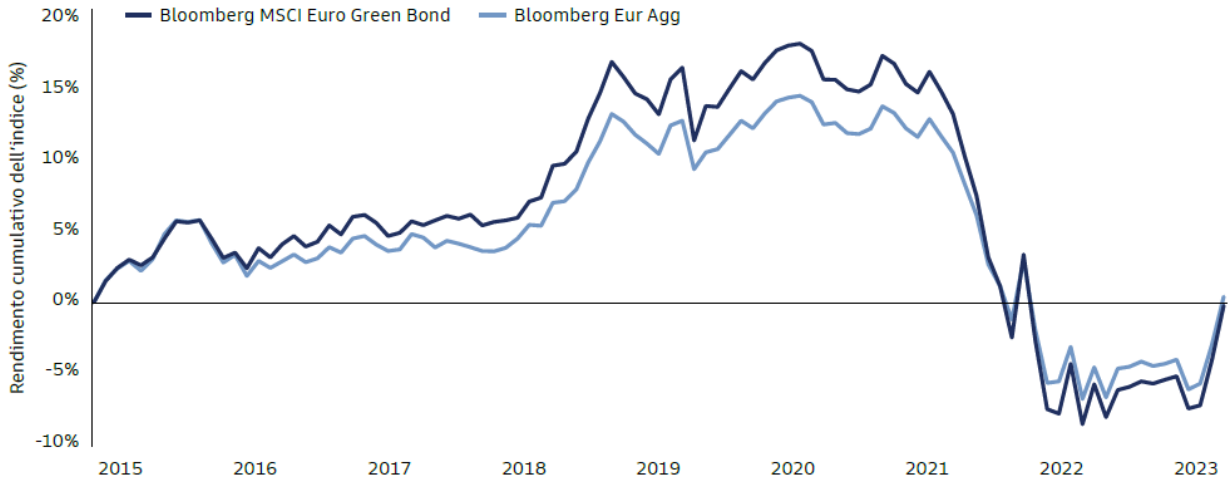

Outstanding (Bn€) - Graph 2
0,4%
19,6%
17,2%
57,0%
5,8%
Green
SDG Linked
Social
Sustanaible
Other


Number of listed bonds - Graph 3
4,1%
21,3%
53,5%
11,0%
Green
SDG Linked
Social
Sustanaible
Other



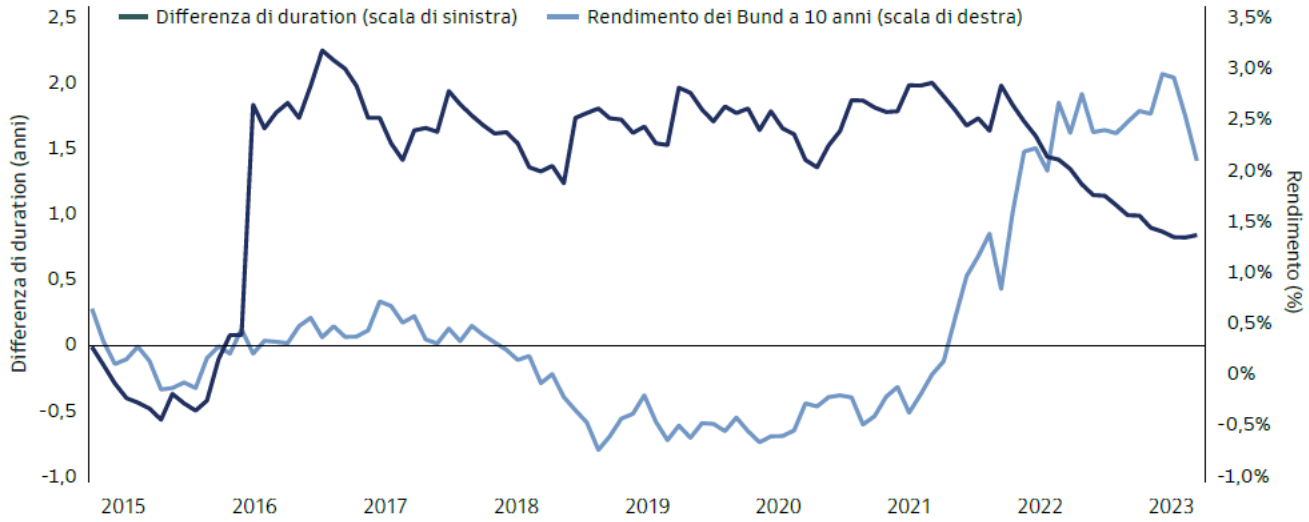


Rendimenti comparativi degli indici green bond e aggregati in euro



Fonte: Bloomberg, Goldman Sachs Asset Management. Al 29 dicembre 2023. **La performance passata non costituisce garanzia di risultati futuri.**

Impatto dei tassi d'interesse sulla duration dell'indice comparativo



Fonte: Bloomberg, Goldman Sachs Asset Management. Al 29 dicembre 2023. **La performance passata non costituisce garanzia di risultati futuri.**

The analysis conducted on CDP and other Italian protagonists naturally opens the door to a reflection on how other advanced economies, in particular the United States, have approached the topic of green bonds and financial sustainability, an aspect that we will explore in depth in the next chapter.

3. The American model of sustainable finance

3.1 The Green Bond Market in the United States

The green bond market has experienced rapid global growth over the last decade. In the United States, green bonds initially emerged through issuances by supranational and state entities: for example, Massachusetts was the first US state to issue a green municipal bond in 2013 (a $100 million emission)[42]. Since then, the volume of municipal green bonds has grown steadily, from around $0.6 billion in 2010 to $4.3 billion in 2018[43]. States such as New York, California and Massachusetts are among the leading issuers of municipal green bonds during this period, reflecting the leading role of local and sub-federal authorities in the US market. In addition to municipal bonds, private actors and federal agencies have also contributed: in the US, these include large companies (e.g. utilities and corporate issuers) and agencies such as Fannie Mae, which is active in the issuance of 'green MBS' (mortgage-backed securities for green projects).[44]

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[42] McManus, K. (2023, May 31). *Case study: Green municipal bonds in Massachusetts, USA - LGiU*. LGiU. https://lgiu.org/case-study-green-municipal-bonds-in-massachusetts-usa/#:~:text=The%20Commonwealth%20of%20Massachusetts%20successfully,the%20amount%20of%20%24100%20million

[43] Flammer, C. (2020). *Green Bonds: Effectiveness and implications for public policy*. https://www.columbia.edu/~cf2870/PDFs/Green-Bonds_CFlammer_NBER2020.pdf

[44] Flammer, C. (2020). *Green Bonds: Effectiveness and implications for public policy*. https://www.columbia.edu/~cf2870/PDFs/Green-Bonds_CFlammer_NBER2020.pdf

Although the US is one of the main markets for green bonds in terms of volume, alongside China and Europe, their development has followed a different pattern from that in Europe. In Europe, the European Union and several national governments have taken a leading role both as issuers (e.g. France launched a €7 billion sovereign green bond in 2017) and as regulators, setting common standards. The EU has introduced a 'green taxonomy' and is finalising a European Green Bond Standard to define unified sustainability criteria for investments. In contrast, there is still no federal green taxonomy in the United States: the US does not have a unified green classification system, and its introduction would face strong political resistance from conservatives. This means that the 'qualification' of a bond as *green* in the US is based on voluntary and market standards rather than a centralised regulatory definition.[45]

In the absence of a federal standard, the governance of green bonds in the US (as globally) has been supported by private and voluntary initiatives. For example, the ICMA Green Bond Principles and third-party certifications (Climate Bonds Initiative, Cicero, etc.) are used to certify the 'greenness' of bonds. However, this decentralised governance leads to variability in criteria and risks of greenwashing, as there is no public body that legally defines what constitutes a green bond. Despite these uncertainties, the market has flourished: in 2018, global annual green bond issuance exceeded $140 billion (up from just $0.8 billion in 2007)[46]. The United States contributes significantly to this total (for example, in 2024 it was the leading country in terms of annual volume of aligned green bonds issued, slightly ahead of Europe at the single-country level), but the American model is characterised by a greater weight of private and local actors than federal policy. In comparison, the European model is more centralised: in 2024, more than half of the global volume of 'aligned' green bonds came from Europe, reflecting EU policies to promote green finance.[47]

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[45] Byrne, D. (2023, April 11). *What is green taxonomy?* The Corporate Governance Institute. https://www.thecorporategovernanceinstitute.com/insights/lexicon/what-is-green-taxonomy/?srsltid=AfmBOorHry9_9v-PuYtfzcIK6A9WSdKZkYtsgH5jY9xIm28NeMNQHh-a#:~:text=,the%20Atlantic%20in%20the%20meantime

[46] Flammer, C. (2020). *Green Bonds: Effectiveness and implications for public policy*. https://www.columbia.edu/~cf2870/PDFs/Green-Bonds_CFlammer_NBER2020.pdf

[47] Climate Bonds Initiative. (2024). *Sustainable Debt Global State of the Market 2024*. https://www.climatebonds.net/files/documents/publications/Climate-Bonds-Initiative_Global-State-of-the-Market-Report_May-2025_2025-06-18-123430_mejk.pdf

3.2 The Inflation Reduction Act and the revival of green finance

In 2022, the United States marked a turning point in climate finance policy with the passage of the Inflation Reduction Act (IRA), considered the largest climate and energy investment law in American history. The IRA, passed under the Biden administration in August 2022, formally aims to reduce inflation, but in reality contains unprecedented climate and energy appropriations (approximately $369 billion) to promote the green transition and cut national emissions by ~40% by 2030 (compared to 2005 levels).[48] Explicit objectives include: accelerating the development of renewable energy and clean technologies, supporting domestic production of electric vehicles and batteries, improving the energy efficiency of buildings and industrial processes, and more generally consolidating American industrial leadership in green supply chains while creating jobs. As analysts have noted, this is a transformative plan to bring the United States closer to its climate commitments[49].

To achieve these goals, the IRA has activated a series of financial instruments and incentives. First, it introduces generous tax credits for renewable energy, electric cars, batteries, green hydrogen technologies and carbon capture projects. These credits reduce both the production costs for green businesses and the purchase costs for consumers, improving the financial viability of clean projects and expanding demand for low-emission technologies[50]. For example, thanks to IRA credits, a company investing in a solar or wind power plant in the US can count on a significant tax reduction, making the project more bankable and less risky. Secondly, the law provides for direct funding and loans: it increases the resources of federal clean energy programmes and establishes ad hoc funds, the most significant of which is the Greenhouse Gas Reduction Fund. The latter is designed as a $27 billion national 'green bank' to mobilise private capital for climate and environmental justice

[48] Schöggl, J., & Baumgartner, R. J. (2024, June 6). The European sustainability revolution. *Brookings*. https://www.brookings.edu/articles/the-european-sustainability-revolution/#:~:text=gas%20emissions%20,to%20meet%20Europe%E2%80%99s%20ambitious%20climate

[49] Schöggl, J., & Baumgartner, R. J. (2024b, June 6). The European sustainability revolution. *Brookings*. https://www.brookings.edu/articles/the-european-sustainability-revolution/#:~:text=gas%20emissions%20,to%20meet%20Europe%E2%80%99s%20ambitious%20climate

[50] Jain, S. K. (2023). *Green bonds and the Inflation Reduction Act (IRA)*. https://www.iima.ac.in/sites/default/files/2023-04/WP%202023-04-03.pdf

projects[51]. Managed by the Environmental Protection Agency (EPA), the fund provides grants and support to green financial institutions (including local ones) to boost investment in clean energy, efficiency and resilient infrastructure. This is, in fact, the first structured federal green finance initiative in the US, aimed at bridging the financing gap by facilitating subsidised loans and mixed financing (blended finance) for climate projects involving disadvantaged communities and innovative sectors.[52]

The IRA, with its instruments, has had an immediate impact on the US sustainable financial market, including green bonds. First, it has improved the economic prospects of many green projects by reducing their risk and increasing expected cash flows thanks to incentives. Following the approval of the IRA, there has been a reduction in the cost of debt for US green companies: in particular, the coupon rates of green bonds issued by US companies (denominated in US dollars) have fallen significantly compared to the pre-IRA period, with an estimated decline of around 0.8–1.0 basis points compared to foreign control groups[53]. This suggests that the market has priced in expectations of a more favourable environment for green businesses, translating into a higher *greenium* (price advantage) for post-IRA US green bonds. In other words, thanks to the IRA, investors perceive green bond-financed projects as less risky and more profitable in the long term, accepting slightly lower returns: a sign of confidence induced by public policy in the sector.

In terms of volumes, the IRA has stimulated renewed momentum. 2023 saw an increase in sustainable bond issuance in the United States, bucking the global slowdown caused by adverse market conditions in 2022. For example, S&P forecasts indicated a recovery in *GSS* (green, social, sustainability) issuance to over $900 billion globally in 2023, with the US market growing driven by investments activated by the IRA[54]. Sectors such as advanced manufacturing (e.g. electric

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[51] *Greenhouse Gas Reduction Fund | US EPA*. (2025, September 9). US EPA. https://www.epa.gov/greenhouse-gas-reduction-fund#:~:text=The%20President%E2%80%99s%20Inflation%20Reduction%20Act,have%20historically%20been%20left%20behind

[52] *Greenhouse Gas Reduction Fund | US EPA*. (2025, September 9). US EPA. https://www.epa.gov/greenhouse-gas-reduction-fund#:~:text=The%20President%E2%80%99s%20Inflation%20Reduction%20Act,have%20historically%20been%20left%20behind

[53] Jain, S. K. (2023). *Green bonds and the Inflation Reduction Act (IRA)*. https://www.iima.ac.in/sites/default/files/2023-04/WP%202023-04-03.pdf

[54] *Global Sustainable Bonds 2023 Issuance To Exceed $900 Billion*. (2023). S&P Global. https://www.spglobal.com/sustainable1/en/insights/special-editorial/global-sustainable-bonds-2023-issuance-to-exceed-900-billion

vehicle production) and energy utilities seized the opportunity to finance projects eligible for IRA incentives by issuing new green bonds. In addition, the IRA triggered international competitive dynamics: concerned about IRA subsidies, the European Union launched its own *Green Deal Industrial Plan* in 2023 to avoid losing ground.[55]

It should be noted that the IRA, in addition to supporting green bonds in the strict sense, has promoted complementary financial instruments. For example, through transferable tax credits and *direct pay* for non-profit entities, it has made it possible to monetise tax incentives in the form of liquidity, effectively creating tradable green financial assets (transferable credits can be bought/sold, generating a market). This increases liquidity for clean projects and can reduce the need for traditional debt financing, or make that debt safer. In addition, the IRA encourages green securitization: with the spread of credit-financed renewable energy installations and efficiency measures, the volume of 'green' cash flows that can be packaged into secured bonds (such as ABSs on residential solar panels, electric vehicle leases, etc.) also grows. Experts therefore expect the market for green asset-backed securities and climate bonds more generally to expand, fuelled by the robust pipeline of projects generated by the IRA.[56]

The Inflation Reduction Act has therefore been a real driver for sustainable finance in the United States since 2022. Through clear objectives (decarbonization and clean reindustrialization) and concrete financial instruments (tax credits, funds and loans, demand support), the IRA has improved market conditions for green projects. This has translated into lower financing costs for green bond issuers[57], an increase in issuance and a broadening of the pool of interested investors (attracted by greater certainty of long-term policies). We can therefore speak of a revival of American green finance after years of uncertainty, which is bringing the US back to a position of leadership in climate investment, albeit with implementation challenges and the need to maintain these policies against possible future policy reversals.

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[55] Schöggl, J., & Baumgartner, R. J. (2024c, June 6). The European sustainability revolution. *Brookings*. https://www.brookings.edu/articles/the-european-sustainability-revolution/#:~:text=fears%20an%20unfair%20economic%20competition,meet%20Europe%E2%80%99s%20ambitious%20climate%20targets

[56] Cameron, J. (n.d.). *Sustainable Finance and the Inflation Reduction Act: 5 Key Takeaways for Issuers and Investors*. sustainalytics.com. https://www.sustainalytics.com/esg-research/resource/corporate-esg-blog/sustainable-finance-inflation-reduction-act-5-takeaways-for-issuers-and-investors#:~:text=Sustainable%20Finance%20and%20the%20Inflation,market%2C%20and%20in%20turn

[57] Jain, S. K. (2023). *Green bonds and the Inflation Reduction Act (IRA)*. https://www.iima.ac.in/sites/default/files/2023-04/WP%202023-04-03.pdf

3.3 Sustainable finance under the Trump presidency

The experience of Donald Trump's presidency offers a prime example of how political orientation can influence, and sometimes hinder, sustainable finance in the United States. During Trump's first term (2017–2021), the Republican administration took an openly skeptical approach to climate policies and ESG considerations in finance. One of its first acts was the announcement in June 2017 that the United States would withdraw from the Paris Climate Agreement, despite pressure from international allies and many industry leaders (including Elon Musk, then a presidential adviser, who resigned from the White House advisory boards in protest).[58] This political signal (the US 'turning its back' on the 2015 global agreement) was accompanied internally by a series of measures aimed at dismantling or weakening existing environmental regulations. In the four years from 2017 to 2021, the Trump administration initiated the review or cancellation of over 100 federal environmental regulations, ranging from the cancellation of the Clean Power Plan on power plant emissions, to the relaxation of efficiency standards for vehicles and appliances, to the removal of restrictions on oil and gas on federal lands[59]. The approach was summed up in the slogan 'energy dominance': Trump wanted to unlock the potential of domestic oil, coal and gas by removing what he considered to be regulatory 'red tape'. The energy market was directly affected: in 2018, the United States increased its production and exports of fossil fuels, while subsidies for renewables were reduced or threatened with cuts.[60]

In the field of sustainable finance, Trump's first term was characterised by an unfavourable, if not hostile, institutional climate. A key episode was the issuance, in late 2020, of a rule by the Department of Labour (DOL) restricting the integration of ESG factors into the management of

[58] Reuters Staff. (2017, June 1). Musk to quit Trump advisory councils after Paris accord decision. *Reuters*. https://www.reuters.com/article/business/energy/musk-to-quit-trump-advisory-councils-after-paris-accord-decision-idUSL3N1IY5LB/

[59] Popovich, N., Albeck-Ripka, L., & Pierre-Louis, K. (2021, January 20). The Trump Administration Is Reversing Nearly 100 Environmental Rules. Here's the Full List. *The New York Times*. https://www.nytimes.com/interactive/2020/climate/trump-environment-rollbacks-list.html

[60] *Trump's Energy Dominance and the Future of Fossil Fuels*. (2018, February 19). State of the Planet. https://news.climate.columbia.edu/2018/02/19/trumps-energy-dominance-future-fossil-fuels/

ERISA-covered pension funds. This rule stipulated that pension plan trustees should only consider 'material' financial factors in their investment decisions, effectively discouraging the inclusion of environmental or social criteria unless supported by clear economic returns. As commented by the Harvard Law Review, this was a reinforcement of the 'hostility' towards ESG, consistent with Trump's idea that pursuing social or environmental objectives 'for their own sake' had no place in the management of pension savings.[61] At the same time, federal financial agencies showed little interest or opposition to climate finance initiatives: the Securities and Exchange Commission (SEC), for example, under the Trump presidency did not put forward any proposals for mandatory climate reporting, and some commissioners even spoke out against what they called the 'politicisation' of financial disclosure with environmental metrics[62]. Despite this picture, it is important to note that many pro-ESG market trends continued throughout 2017-2020, driven by private actors and state governments. For example, the US green bond market continued to expand (from $50 billion globally in 2015 to over $250 billion in 2019[63]), driven by companies and municipalities regardless of federal support. Furthermore, in the face of Washington's climate leadership vacuum, the 'We Are Still In' alliance of states and cities determined to meet the Paris targets on their own was formed, a sign of subnational resilience. However, the absence of central impetus and the regulatory uncertainty created by continuous rollbacks had a dampening effect: investments in renewables and efficiency projects slowed due to the suspension of tax credits and the elimination of long-term regulations. There was also a backlash from investors: the 'Trump effect' consisted of less enthusiasm for ESG strategies in the US domestic market than in Europe, partly because the federal government signalled little attention to climate issues. In short, the first four years of the Trump administration showed that, in a context of environmental deregulation, sustainable finance in the US did not come to a halt but continued to move forward against the tide, supported mainly by market factors and local initiatives rather than federal policies.

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[61] *Rethinking Retirement Savings - Harvard Law Review*. (2023, March 24). Harvard Law Review. https://harvardlawreview.org/forum/vol-134/rethinking-retirement-savings/

[62] *Financial Regulation, Climate Change, and Climate-related Risk Disclosure – Environmental and Energy Law Program*. (2025). Harvard.edu. https://eelp.law.harvard.edu/tracker/financial-regulation-climate-change-and-climate-related-risk-disclosure/

[63] Weaver, J. F. (2017, August 16). *EGEB: Tesla skips "green bonds"; French solar+storage 40% price drop; Arizona corruption?; more*. Electrek. https://electrek.co/2017/08/16/egeb-4/

Trump's second term, which has just begun, has accentuated many of the trends already seen in his first term, with potentially even deeper impacts given the current context. Taking office again in January 2025, Trump quickly embarked on a climate and institutional 'counter-reform' agenda. On the environmental policy front, the administration has proceeded to dismantle the pillars of climate action launched by his predecessor Biden. One of the most significant measures was the executive order of 8 April 2025 to block the application of state laws aimed at reducing emissions or ESG finance, if considered to conflict with 'national energy dominance'. In particular, Trump has tasked the Department of Justice with identifying and challenging regulations in states such as New York, California and Vermont that penalise oil companies or introduce *cap-and-trade* schemes, arguing that such local initiatives 'threaten the economic and national security' of the US. This move has been welcomed by the fossil fuel industry (American Petroleum Institute) and strongly contested by Democratic governors, who have reiterated that they will continue to advance climate solutions at the state level and have questioned the federal government's legitimacy to prevent them from protecting clean air and water for their citizens[64]. In parallel, the new administration has targeted the regulatory legacy of the Biden period: Trump-appointed EPA chief Lee Zeldin announced on the start of the process *to revoke the 'endangerment finding',* the scientific and legal assessment that greenhouse gases threaten public health, which has been the legal basis for all emissions regulations in the United States since 2009. If finalised, this revocation would remove the legal basis for limits on CO_2 emissions from vehicles, power plants and industries, achieving 'the biggest deregulatory move in US history', in the words of Zeldin himself. Environmental organisations have called this initiative 'the end of the road for US climate action': a clear signal to the most polluting sectors that from now on they will be able to 'pollute more' without restrictions[65]. The move highlights the Trump administration's desire to radically reverse the regulatory advances of the previous era, even at the cost of a head-on collision with the scientific community and part of the business world in favour of stable rules.

In parallel with the strict environmental level, Trump's second term has also seen initiatives aimed at reshaping the government apparatus with potential indirect effects on sustainability. A case in

[64] Reuters . (2025, April 9). Trump issues order to block state climate change policies. *Reuters*. https://www.reuters.com/sustainability/climate-energy/trump-issues-order-block-state-climate-change-policies-2025-04-09/

[65] Volcovici, V., & Shepardson, D. (2025, July 30). Trump's EPA targets key health ruling underpinning all US greenhouse gas rules. *Reuters*. https://www.reuters.com/legal/litigation/trumps-epa-targets-key-health-ruling-underpinning-all-us-greenhouse-gas-rules-2025-07-29/

point is the creation of the Department of Government Efficiency (DOGE), a new office tasked with finding efficiencies and cutting waste in the federal bureaucracy. Announced by Trump shortly after his re-election and formalised by executive order on 20 January 2025, DOGE was presented as a tool to 'streamline federal agencies, eliminate unnecessary spending and deregulate'[66]. The key figure associated with this structure is Elon Musk (who we will discuss in more detail later), appointed as special advisor and de facto supervisor of the programme, so much so that the press has called him the 'leader' of DOGE, although formally his role was that of advisor. In early 2025, Musk participated in several events with Trump to promote the DOGE agenda of cutting 'unproductive' public spending and reforming the administration[67]. From a sustainable finance perspective, DOGE had no environmental mandate; on the contrary, some of its actions, such as hiring freezes in agencies and the suspension of programs deemed 'unnecessary', also affected key offices such as the Environmental Protection Agency and the Department of Energy, potentially slowing down climate and efficiency initiatives.[68] It should also be noted that Musk's experiment in government proved short-lived and turbulent: by April 2025, Elon Musk had already begun working remotely from Washington following internal disputes, and at the end of May, the White House confirmed his formal departure from the DOGE while retaining an external advisory role. Trump himself hailed Musk as the 'Dogefather' and praised his contribution, but the episode highlighted tensions and difficulties in bringing a disruptive 'entrepreneurial' style into rigid government structures[69]. For sustainable finance, the whole affair is significant because it shows how the new administration's priorities (accounting efficiency, deregulation, reduction of the state's presence) have marginalised ESG issues, when they have not viewed them with suspicion. Particularly representative was the attitude towards climate transparency efforts: in March 2025, with the SEC

[66] Picchi, A. (2025, February 7). *What is DOGE? Here's what to know about Elon Musk's latest cost-cutting efforts.* Cbsnews.com; CBS News. https://www.cbsnews.com/news/what-is-doge-elon-musk-findings-trump/

[67] Wikipedia Contributors. (2024, November 28). *Department of Government Efficiency*. Wikipedia; Wikimedia Foundation. https://en.wikipedia.org/wiki/Department_of_Government_Efficiency

[68] Bing, K. (2025, February 20). *DOGE's Millions: As Musk and Trump Gut Government, Their Ax-Cutting Agency Gets Cash Infusion*. ProPublica. https://www.propublica.org/article/doge-trump-musk-funding-foia-congress-transparency

[69] Bing, K. (2025, February 20). *DOGE's Millions: As Musk and Trump Gut Government, Their Ax-Cutting Agency Gets Cash Infusion*. ProPublica. https://www.propublica.org/article/doge-trump-musk-funding-foia-congress-transparency

board majority passing to the Republicans, the Commission abandoned its court defence of the climate disclosure rules introduced in 2022 under Biden, suggesting that it wanted to shelve them ; a clear step backwards on climate finance and ESG risks for listed companies.[70]

In Trump's second term, therefore, American sustainable finance finds itself once again navigating rough waters. On the one hand, the IRA legislation is still formally in force, but the administration has attempted to scale it back: in April 2025, the White House ordered a freeze or review of IRA spending programmes on climate and renewables, and the Republican-controlled Congress discussed proposals to cut 'green' tax credits as part of deficit reduction measures. On the other hand, the most innovative and sustainability-conscious sectors, from tech companies to renewable energy utilities, continue to push forward, bolstered by investments already launched in the previous phase. This creates a patchwork situation: progressive states and companies continue on their green path, while the federal government redirects priorities and resources elsewhere. Tensions are openly apparent, as in the legal battles between coalitions of Democratic states and the federal administration over climate policy[71]. Observers are talking about *'climate whiplash'* to describe the shift from the green acceleration of 2022-2023 to the sharp slowdown of 2025[72]. For the financial community, this means uncertainty: for example, banks and funds must recalibrate their ESG strategies in line with the new context, knowing that previously imminent regulations (such as the SEC climate rule) may not see the light of day, and that some jurisdictions may even discourage sustainable practices (think of the states that in 2023-24 banned their treasuries from doing business with banks considered *'anti-oil')*. At the same time, global and economic trends (growing competitiveness of renewables, pressure from international institutional investors for decarbonised portfolios, etc.) do not stop at political borders: many US companies have maintained voluntary sustainability commitments even under Trump, driven by investors and consumers. For example, large asset managers such as BlackRock and State Street, despite criticism from conservative

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[70] *Financial Regulation, Climate Change, and Climate-related Risk Disclosure – Environmental and Energy Law Program*. (2025). Harvard.edu. https://eelp.law.harvard.edu/tracker/financial-regulation-climate-change-and-climate-related-risk-disclosure/

[71] McDermott, J. (2025, May 5). *States sue Trump administration for blocking the development of wind energy*. AP News. https://apnews.com/article/wind-energy-trump-executive-order-lawsuit-17f9d2b2f177849d8d49878a1cac93e4

[72] Hirji, Z. (2025, January 25). *Trump's Climate Whiplash*. Bloomberg.com; Bloomberg. https://www.bloomberg.com/news/newsletters/2025-01-25/trump-s-climate-whiplash

circles, continue to promote climate initiatives with the companies in their portfolios, knowing that they are responding to long-term demand. Ultimately, the Trump era highlights the volatile and politically divisive nature of sustainable finance in the United States: periods of progress and federal support can be followed by periods of stagnation or reversal, making the overall trajectory less linear than in other countries.

This instability may slow progress in the short term; however, as we have seen, it does not cancel it out, as other actors (the market, states, civil society) are filling part of the national leadership vacuum. The fact remains that the absence of a coherent long-term federal strategy is a structural brake: in order to invest heavily in the ecological transition, companies need regulatory certainty and stable incentives, which are called into question by every change of administration. The challenge for the future will therefore be to stabilise these policies to prevent the United States from squandering competitive advantages in key sectors due to political fluctuations.

3.4 The Tesla case: a missed green bond opportunity?

A symbolic case of the relationship between innovative private enterprise and sustainable finance in the US is that of Tesla and its 2017 bond issuance. Tesla, a Californian pioneer in electric vehicles, is closely linked to the sustainable transition through its mission and business model. Despite this, when the company launched a $1.8 billion Senior Notes issue in August 2017, a corporate bond intended to finance the accelerated production of the Model 3, it chose not to formally label it as a 'green bond'[73]. This decision was met with surprise and some "regret" among green finance observers, who wondered why Tesla, a paradigm of green business, had decided not to certify its bonds as green, missing out on the opportunity to launch the first high-profile *corporate green bond* in the United States.

What were the characteristics of Tesla's 2017 emission? It was a senior unsecured bond with a 5.30% coupon and maturity in 2025, with a speculative rating (Moody's B3) given the riskiness of an automotive company that was still growing and unprofitable. The proceeds were intended to 'strengthen the capital structure during the rapid production ramp-up phase with the launch of the

[73] *Tesla's Senior Notes Going Green- Analysis of Tesla's Sustainable Bonds*. (n.d.). Sustainable Investing. https://sustainableinvest.com/are-teslas-senior-notes-green/

Model 3, and for general corporate purposes'. In fact, the funds were used by Tesla to develop projects clearly aligned with environmental objectives, primarily the expansion of mass electric mobility (the Model 3 was the electric vehicle intended for the mainstream market). Given the nature of the company (Tesla's mission is to 'accelerate the world's transition to sustainable energy') and the use of the funds, the bond could easily have fallen within the common definitions of green bonds (financing clean transport, renewable energy through SolarCity, stationary batteries, etc.). However, Tesla did not establish a Green Bond Principles framework or seek external certification, issuing the bond as a traditional security.[74]

Analysts have offered various interpretations for this *'failed green bond*'. A benevolent interpretation argues that, beyond the formal label, the 2017 Tesla bonds were essentially green in nature. In other words, even without an official label, the projects financed (electric cars, batteries, domestic solar energy) contributed directly to climate mitigation; discerning investors could still have considered them sustainable investments by virtue of the company's core business. Henry Shilling, Senior Vice President and Head of ESG at Moody's Investors Center, an expert in sustainable finance, noted that it is *'difficult to argue that Tesla's notes are not green, given that the company is committed to drastically reducing transport emissions',* and suggested that Tesla bonds 'should be considered as such (green) by investors' even without a formal label. This argument highlights an interesting point: substance versus form. Tesla, being a company unanimously perceived as *cleantech,* could afford not to label its bonds and trust that the market would still recognise them as having a positive ESG profile.[75]

On the other hand, many observers pointed out what was lost by not labelling them. Assigning a Green Bond Label to Tesla 2017 would have brought tangible and symbolic benefits. Firstly, it would have been a strong image boost: a high-profile issuer such as Tesla formally embracing the Green Bond Principles would have drawn attention to climate change and sustainability in the midst of the Trump era (also as a gesture of private leadership opposed to federal policy). Second, the bonds would have had access to a broader base of sustainable investors: many ESG funds or green bond funds follow mandates that explicitly require green-labelled securities. By foregoing the label,

[74] *Tesla's Senior Notes Going Green- Analysis of Tesla's Sustainable Bonds*. (n.d.). Sustainable Investing. https://sustainableinvest.com/are-teslas-senior-notes-green/

[75] Shilling, H. (2017, September). *Henry Shilling: Are Tesla's Senior Notes Green?* Responsible Investor. https://www.responsible-investor.com/henry-shilling-are-teslas-senior-notes-green/

Tesla ruled out participation by these specialised investors, who in 2017 complained about the scarcity of corporate green bonds in the US[76]. At the time, the US corporate green bond market was limited, with European companies more active, and a 'green' Tesla bond would have been a valuable new component for sustainable portfolios. Some commentators speculated that Tesla's decision was motivated by practical considerations, namely to avoid the (albeit modest) additional costs and reporting burdens associated with a certified green issue at a time when the company was under financial pressure and urgently needed to raise capital. Elon Musk may have considered the label unnecessary, confident in the strength of the Tesla brand to place the bond. Furthermore, Tesla has always had a following of almost 'ideological' retail and institutional investors, convinced of its mission, who would have subscribed to the bond anyway, as indeed happened, given that the issuance was successfully placed and expanded from $1.5 billion to $1.8 billion due to high demand.[77]

It is interesting to note that, in retrospect, Musk has often been critical of certain mechanisms of ESG finance (see §3.5): for example, he called certain ESG ratings "a scam" when Tesla was excluded from an index[78]. This perhaps reflects a certain skepticism about traditional environmental metrics and a preference for following his own narrative. We could therefore interpret the lack of a label on the 2017 bond as consistent with Musk's *unconventional* attitude: instead of seeking approval from ESG agencies, Tesla aimed to convince the market with its own results. From the perspective of sustainable investors, however, that episode remains a warning: voluntary adherence to green schemes is not a given even for 'green' companies, and incentives or pressure are needed for them to fully embrace sustainable finance best practices.

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[76] *Tesla's Senior Notes Going Green- Analysis of Tesla's Sustainable Bonds*. (n.d.). Sustainable Investing. https://sustainableinvest.com/are-teslas-senior-notes-green/

[77] *Tesla's Senior Notes Going Green- Analysis of Tesla's Sustainable Bonds*. (n.d.). Sustainable Investing. https://sustainableinvest.com/are-teslas-senior-notes-green/

[78] Kerber, R., & Jin, H. (2022, May 19). Tesla cut from S&P 500 ESG Index, and Elon Musk tweets his fury. *Reuters*. https://www.reuters.com/business/sustainable-business/tesla-removed-sp-500-esg-index-autopilot-discrimination-concerns-2022-05-18/

3.5 Musk between business, government and sustainability

After talking about one of his companies, we now turn our attention to its CEO. Elon Musk embodies in a unique way the intertwining of entrepreneurial innovation, commitment (or involvement) in public policy and environmental sustainability issues. Over the past decade, Musk has emerged as one of the world's most influential entrepreneurs, leading companies that have redefined entire industries: from Tesla to SpaceX, which is revolutionising the aerospace industry, to the acquisition of the social network X (formerly Twitter) and the co-founding of companies in the fields of solar energy (SolarCity) and neurotech (Neuralink). This multifaceted entrepreneurial activity has a common denominator in his vision of the technological future, but it has ambivalent implications for sustainability. On the one hand, Musk has been a pioneer of the green economy: with Tesla, he has contributed more than anyone else to the global spread of electric vehicles, accelerating the transition from internal combustion engines to zero-emission forms of mobility. He has invested in giant battery plants to stabilise renewable energy grids (such as the Tesla Megapack) and launched projects such as SolarCity to bring solar panels to American rooftops. In 2018, Musk proudly announced that all Tesla factories would be powered by renewable energy, and the company published detailed environmental impact reports[79]. In this sense, Musk has often presented himself as a champion of sustainable innovation, attracting the admiration of climate-conscious investors and earning prominent positions: in 2017, he was invited to join the economic advisory councils of newly elected President Trump, in the hope of steering the administration towards pro-business but also pro-clean technology policies.

At the same time, Elon Musk is a complex and sometimes contradictory figure, especially when looking at his relationship with government and politics. In June 2017, as mentioned above, Musk publicly broke with Trump, leaving the White House councils after the decision to withdraw from the Paris Agreement. On that occasion, he tweeted bluntly: 'Climate change is real. Withdrawing from Paris is not good for America or the world'[80]. This gesture was applauded by environmentalists

[79] Tesla. (2018). IMPACT REPORT. In *IMPACT REPORT*.

[80] Reuters Staff. (2017, June 1). Musk to quit Trump advisory councils after Paris accord decision. *Reuters*. https://www.reuters.com/article/business/energy/musk-to-quit-trump-advisory-councils-after-paris-accord-decision-idUSL3N1IY5LB/

and seen as proof of Musk's sincere belief in the climate emergency, to the point of putting principles (staying in the Paris Agreement) before access to the corridors of power. Musk seemed then to embody a new generation of *'committed'* entrepreneurs, ready to advise governments but also to distance themselves if they disagreed on fundamental values.

Yet, a few years later, Musk's relationship with politics and government took a different turn. In the 2022-2024 election cycle, Musk shifted his sympathies towards libertarian and conservative circles: he became an outspoken critic of part of the Democratic agenda (especially on social media regulation and taxation) and began actively supporting Republican candidates, including Donald Trump. In 2023-24, he was one of the Republican Party's biggest individual donors, contributing tens of millions of dollars to PACs and campaigns. In July 2024, Musk even publicly declared his endorsement of Trump, a surprising move given their clash on climate change just a few years earlier. This change is likely due to a variety of factors: Musk's disagreements with Democrats on issues such as the management of Twitter/X and online freedom of speech, the hostility of some progressive circles towards super-billionaires, and perhaps Musk's appreciation of Trump's anti-bureaucratic approach. Certainly, this evolution led Musk to join Trump's second administration not as an external 'critical voice', but almost as a partner: his aforementioned informal appointment as head of the DOGE is the most obvious evidence of this. This raises a paradox: Elon Musk, whose fortune is built on electric cars and solar energy, became a cog in a government that promoted coal and oil and ridiculed environmental concerns. How can this be reconciled?

In the strict financial sphere, Musk has played an important role in the sustainability debate. As mentioned, he has criticised traditional ESG approaches, especially when he perceived them as unfairly penalizing Tesla. After Tesla was excluded from the S&P 500 ESG Index in 2022, Musk called ESG ratings "a scam" and accused the index managers of "weaponizing" these criteria for ideological purposes[81]. This outburst was widely echoed on Wall Street, fuelling discussions about the limitations and inconsistencies of certain ESG ratings. Some applauded Musk for pointing out the problem (notably that an electric vehicle manufacturer was excluded while traditional oil companies appeared in the same index) and highlighting the need for improved metrics and transparency. Others, however, saw Musk's words as a risk of delegitimising the entire ESG movement and giving ammunition to critics of sustainable finance. In fact, Musk has become a

[81] Kerber, R., & Jin, H. (2022, May 19). Tesla cut from S&P 500 ESG Index, and Elon Musk tweets his fury. *Reuters*. https://www.reuters.com/business/sustainable-business/tesla-removed-sp-500-esg-index-autopilot-discrimination-concerns-2022-05-18/

reference point for the 'anti-ESG' movement: conservative politicians (such as Florida Governor Ron DeSantis) have cited the Tesla affair to attack responsible investment, and Musk himself often interacts on social media with figures who brand ESG as 'woke' excess in the economy.

In my view, the South African entrepreneur combines genius and madness, resulting in a character who is certainly brilliant and visionary, but also unpredictable. It will be interesting to see what trajectory his entrepreneurial and political life will take in the coming months, after his abrupt exit from the Trump administration.

3.6 An American model of sustainable finance: between private leadership and political instability

Compared to the Italian model described in the previous chapter, more oriented towards standards and coherent public initiatives, the American one therefore offers a different vision, less standardized and more sensitive to contingent political changes.

The analysis conducted so far reveals a unique American model of sustainable finance, characterised by a peculiar mix of strengths and weaknesses. The United States shows extraordinary leadership from the bottom up, driven by the private sector and decentralised initiatives, but at the same time suffers from marked political and institutional instability on the issue of sustainability. This counterbalance between private dynamism and public fluctuations defines the US trajectory, distinguishing it from that of other advanced economies.

In terms of private leadership, the US boasts some of the world's leading players in finance and sustainable innovation. Large US corporations and domestic financial markets have been able to mobilise significant resources towards green objectives, often ahead of or in the absence of clear government directives. The case of Tesla, discussed above, is a perfect example: a Californian company has catalysed billions of dollars of venture capital and bond market investment to revolutionise electric cars, helping to make the United States an industrial leader in sustainable mobility, while the federal government (in 2017-20) not only failed to push in that direction but also eliminated efficiency standards for petrol vehicles. Similarly, giants such as Google, Apple and Microsoft issued green bonds and invested heavily in renewable energy to power their data centres well before there were any regulatory requirements: in the decade 2010-2020, US ICT companies

were among the world's largest private purchasers of wind and solar energy[82]. Large US asset managers and pension funds – despite all the contradictions involved – have begun a transition towards more sustainable portfolios: for example, in 2020, the Californian government pension fund CalPERS set climate neutrality targets for its investments, and financial giants such as BlackRock have been asking their investee companies for decarbonisation plans since 2021. This market push is also reflected in the figures: the United States is among the leading countries in terms of assets under management in ESG funds (around $3.3 trillion in 2022, despite outflows due to political controversy) and, as we have seen, has risen to the top in terms of green and sustainable bond issuance[83]. Furthermore, at the state and local level, the US has examples of innovative governance: states such as California and New York have imposed advanced rules (standards on car emissions, climate risk disclosure for financial institutions, etc.), establishing *de facto* regional sustainable finance markets that are almost as robust as those of entire European countries. In summary, America excels when its economic civil society (businesses, investors, local authorities) takes action in an entrepreneurial and voluntary manner: the enormous depth of US capital markets and the culture of innovation allow capital to be channelled towards new technologies (think of the explosion of investment in cleantech start-ups, offshore wind power and commercial electric vehicles) whenever opportunities for profit and growth are glimpsed. This agility and private risk-taking capacity is a structural advantage for the US: for example, while Europe pushed sustainable finance through regulation (EU Taxonomy, ESG reporting requirements), in the US, a more laissez-faire approach has allowed for different approaches and competition of ideas, with some companies raising standards independently for reputational reasons or stakeholder pressure. Moreover, the US financial sector has often integrated sustainability to mitigate long-term risks: suffice it to recall that as early as 2019, the Fed was discussing giving the green light to climate scenario analysis at large banks, and several insurance companies had reduced their exposure to carbon-intensive industries after record-breaking hurricanes[84]. In short, when Washington is absent, Wall Street and Silicon

[82] Pichai, S. (2020, September 14). *Our third decade of climate action: Realizing a carbon-free future*. Google. https://blog.google/outreach-initiatives/sustainability/our-third-decade-climate-action-realizing-carbon-free-future/

[83] Climate Bonds Initiative. (2024). *Sustainable Debt Global State of the Market 2024*. https://www.climatebonds.net/files/documents/publications/Climate-Bonds-Initiative_Global-State-of-the-Market-Report_May-2025_2025-06-18-123430_mejk.pdf

[84] *Financial Regulation, Climate Change, and Climate-related Risk Disclosure – Environmental and Energy Law Program*. (2025). Harvard.edu. https://eelp.law.harvard.edu/tracker/financial-regulation-climate-change-and-climate-related-risk-disclosure/

Valley (together with local governments) do not necessarily stand still: they have, within certain limits, pushed ahead with the green transition, driven by economic convenience, social expectations and global dynamics. This private ferment is at the heart of the 'American model', an approach that is not always coordinated but is certainly effervescent.

On the other hand, the aspect of political instability cannot be underestimated, and is the weak side of the model. In recent years, the United States has experienced extreme swings in public policy on climate and sustainable finance, with alternating administrations of opposite stripes (Obama pro-climate, Trump anti-regulation, Biden again pro-climate, Trump II again rollback) creating a 'pendulum' effect. This makes it difficult for economic operators to plan for the long term and risks slowing down investments that require decades of certainty. A green infrastructure investor in the US, for example, had to assess in 2021 whether the IRA tax credits would last long enough or whether a change of government would cut them, which is an uncertainty that may partly reduce the stimulus effectiveness of such measures. Similarly, listed companies have experienced regulatory ups and downs: first the expectation of having to disclose climate risks (under Biden, with the SEC proposing a detailed rule), then the 2025 twist with the Trump SEC abandoning that rule. This regulatory vacuum means that some US multinationals may find themselves having to comply with international ESG standards (such as those in Europe) but not domestic ones, creating misalignments and potential double compliance costs, or it may cause some companies that are less sensitive to neglect climate reporting until they are required to do so. At the federal level, there is also growing politicisation of sustainable finance: ESG has become a polarising issue in American public discourse, with Republican politicians portraying it as an intrusive 'woke' agenda and some Democrats promoting it as a pillar of financial reform. This ideological divide has led, for example, 19 Republican-led states to introduce measures to limit relations with banks deemed anti-fossil fuel or to prohibit state pension managers from considering ESG parameters in their investments. These measures, in addition to having practical implications (some banks have withdrawn from bond issues in Texas, reducing competition and slightly increasing financing costs for Texas local authorities), are evidence of a climate of political uncertainty surrounding sustainable finance. European countries have adopted climate laws with broad parliamentary support, making them more stable; the United States, on the other hand, having failed to reach a cross-party consensus, exposes green finance to the risk of rollback. Even the massive IRA, despite already disbursing funds, remains under fire: in 2025, with the so-called 'Limit, Save, Grow Act', the GOP-controlled House proposed cutting tens of billions of green credits from the IRA, signalling its intention to

scale back federal climate action under the new leadership. The political battle continues, and with it the uncertainty.[85]

In this context, there are positive aspects: the flexibility and creativity of the US market mean that, despite everything, capital flows towards sustainable opportunities when they become profitable. Global investors are not giving up on the US market. On the contrary, the IRA has attracted European and Asian investment to the US, showing that with the right incentives, America's economic magnetism is very powerful. Furthermore, the political battles have brought the issue to the fore: it is being discussed, and in some ways sustainable finance has 'broken out of the circles' to become a topic for rallies, for better or for worse. The risk, however, is that instability will cause the US to lose ground in the global transition race. A report by *S&P Global* warned that 'political headwinds' in some US states could slow the growth of the green bond market compared to other regions[86].

In conclusion, as highlighted above, the US model of sustainable finance can be described as a system in which leadership is often private and fragmented, while public guidance is cyclical and uncertain. This has led to significant successes (especially in technological innovation and capital mobilisation) but also delays and inconsistencies compared to other economies with more stable visions. If the US manages to align these two souls in the future, for example by establishing a minimum common denominator of climate policies accepted by both parties and then leaving the market free to exceed it in ambition, it could unleash unparalleled power in global sustainable finance, combining enormous economic potential with strategic certainty. Failing that, they will continue to proceed in fits and starts: vigorous sprints followed by sudden stops. In the meantime, the chaotic American model, despite all its flaws, shows the world that the drive of entrepreneurship and private finance is a key driver of sustainability, but also that without a stable political framework, that engine risks running on empty in the long term. Finding a balance between these forces remains the key challenge for defining, in the coming years, a true American model of sustainable finance that is coherent, inclusive and durable.

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[85] Riki Fujii-Rajani, & Patnaik, S. (2025, January 6). *What will happen to the Inflation Reduction Act under a Republican trifecta?* Brookings. https://www.brookings.edu/articles/what-will-happen-to-the-inflation-reduction-act-under-a-republican-trifecta/

[86] https://www.spglobal.com/sustainable1/en/insights/special-editorial/global-sustainable-bonds-2023-issuance-to-exceed-900-billion#:~:text=Many%20factors%20that%20could%20stifle,other%20sectors%2C%20including%20nonfinancial%20corporates