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"From Financial Fragmentation to Integration: A Comparative Analysis of Sustainable Taxonomy Frameworks in the EU, China, USA, and Indonesia, with Pathways Toward a Broader Approach"

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It has to start somewhere, it has to start sometime
What better place than here, what better time than now?

- Rage Against the Machine (Guerrilla Radio, 1999)

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INTRODUCTION

In the unfolding story of the twenty-first century, few challenges weigh as heavily on our collective future as the pursuit of sustainability. Climate change, biodiversity loss, and widening inequalities remind us that the architecture of our economies and financial systems must be reimagined. At the heart of this transformation lies not only the question of *what* is sustainable, but also *how* such sustainability can be defined, measured, and operationalized. Taxonomies — systems of classification that translate abstract ideals into practical standards — thus emerge as essential instruments in aligning finance with the planetary boundaries and social thresholds that define a just and livable world.

Yet taxonomies are never neutral. They are constructed through political negotiation, technical expertise, and normative vision. They crystallize divergent conceptions of sustainability into rules that shape investment flows and, ultimately, development pathways. To study them is therefore to enter a space where science and policy meet, where economic ambition confronts ecological reality, and where visions of the future are inscribed into the language of regulation.

This thesis explores sustainable taxonomies on three interconnected levels. First, it illustrates the general logic and architecture of sustainable classification systems, examining how they have evolved as responses to global sustainability imperatives. Second, it engages in a comparative analysis of four influential cases: the European Union, whose taxonomy has become a global reference point; China, whose classification system reflects both its developmental priorities and its position as the world's largest emitter; the United States of America, where the absence of a unified taxonomy reveals both political fragmentation and regulatory experimentation; and Indonesia, a pivotal emerging economy whose sustainable finance framework offers insights from the Global South. Through this comparison, the thesis seeks to illuminate not only the technical divergences among these systems, but also the underlying cultural, political, and economic rationalities that shape them.

Finally, this work moves beyond comparison toward imagination. It proposes a way to broaden taxonomies — rendering them more comprehensive, dynamic, and impactful. In doing so, the thesis argues for a taxonomy that transcends a narrow, sectoral focus on environmental metrics and instead embraces the interdependence of ecological, social, and economic dimensions of sustainability. Such a framework would not merely classify activities, but guide transformative change, offering a shared compass for navigating an era marked by profound uncertainty and urgent necessity.

The journey undertaken in these pages is thus both analytical and aspirational. It is analytical in its effort to deconstruct and compare existing taxonomies, situating them within their institutional and geopolitical contexts. But it is also aspirational, for to reflect on taxonomies is to recognize their role as instruments of hope: imperfect, contested, and yet indispensable tools through which societies attempt to name, and thereby to realize, a sustainable future.

CHAPTER 1: *Fundamentals of Sustainable Finance*

1.1 The concept of Sustainability

There is a plethora of definitions attempting to capture the essence of what is known as sustainability. As frequently happens, indeed, the broader and more complex a notion is, the harder the formalization of its description results. Such difficulty in a clear usage of semantics can ultimately lead to misinterpretations and misapprehensions. But of all the things we can afford to have doubts or ambiguities about, sustainability cannot be one of them, especially in recent times.

Today's general understanding of sustainability usually entails ideas of *green* societies, clean energy implementation and engagement in unharmful activities for the environment ("environmentally friendly", so to say, or at least neutral). All correct beliefs, but not properly complete and effective in grasping sustainability's significance if considered in isolation and not placed in a wider context. Moreover, this holistic conceptualization of sustainability not only tends to be erroneously *climate-centric* (hence excluding fundamental variables from the definition and consequently altering the perception of it), but also grants a static and unchanging connotation to the term. To be clearer, sustainability may often be mistakenly regarded as: a) a non-versatile goal concerning the context in which it is to be achieved; b) a challenging objective to pursue, given the friction between it and the profit-maximizing way in which our markets are structured; or c) an aspiration to which individuals may grant little to no contribution due to their impossibility to act freely when it comes to the adoption of measures that are conclusively destined to government approval.

Nowadays' reality consists of a major part of the world's population having a flawed or incomplete view of sustainability, while a small share acknowledges its meaning and the need for change but it is most of the time refrained from pursuing it; firms conflicted between the usual capitalist way of operating and more sustainable profit strategies that may result in reduced revenues; and world's governments divided by conflicting ideas on the topic, instead of being united for the achievement of a common target: preserving this planet and embarking on a quest for sustainable economic pathways.

However, one of the few exceptions that stands as the ultimate example of intergovernmental effort in tackling the problems posed by the unsustainable inclination our world's functioning is taking, is the creation of the 2030 Agenda for Sustainable Development[1]. This action program takes into consideration equally important spheres of *advancement*, vulgarly referred to as the *five Ps* of sustainable development: People, Prosperity, Peace, Partnership, and Planet. Signed by all the members of the United Nations on 25th September 2015, the Agenda is composed of 17 Sustainable Development Goals and 169 associated targets, most of them aimed to be reached by the end of 2030[2]. Despite the joint governments' endeavor*, the 2024 progress assessment reveals the world is severely*

[1] UN, THE 17 GOALS | Sustainable Development. Retrieved 20 March 2025, from https://sdgs.un.org/goals

[2] As explicated, the overarching target year for achieving the SDGs is 2030. However, some goals and targets may have specific interim targets or deadlines before 2030. For example, Goal 2 (Zero Hunger) includes an interim target to achieve, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, according to the UN

off-track to achieve the 2030 Agenda[3]. Out of all targets nearly half, precisely 48%, exhibit moderate to severe deviations from the desired trajectory, and perilously, 18% have stagnated, and 17% have regressed below the 2015 baseline levels[4]. Always according to the United Nations, none of the 193 Member States could be formally considered an *achiever* following the SDGs Compliance Scale[5].

A truthful representation of the current situation is additionally aggravated by governments not only non-implementing enough exertions and funds for the actual achievement of the SDGs — either because such financial resources are lacking in their entirety or because they are not sufficient for an effective allocation — but by countries retrogressing from their initial standpoint given their ambiguities regarding sustainability[6], ultimately burdening on the shoulders of the rest of the globe. Essentially, we live in a world where few fight for many, a world whose *biggest threat is the belief that someone else will save it* [7].

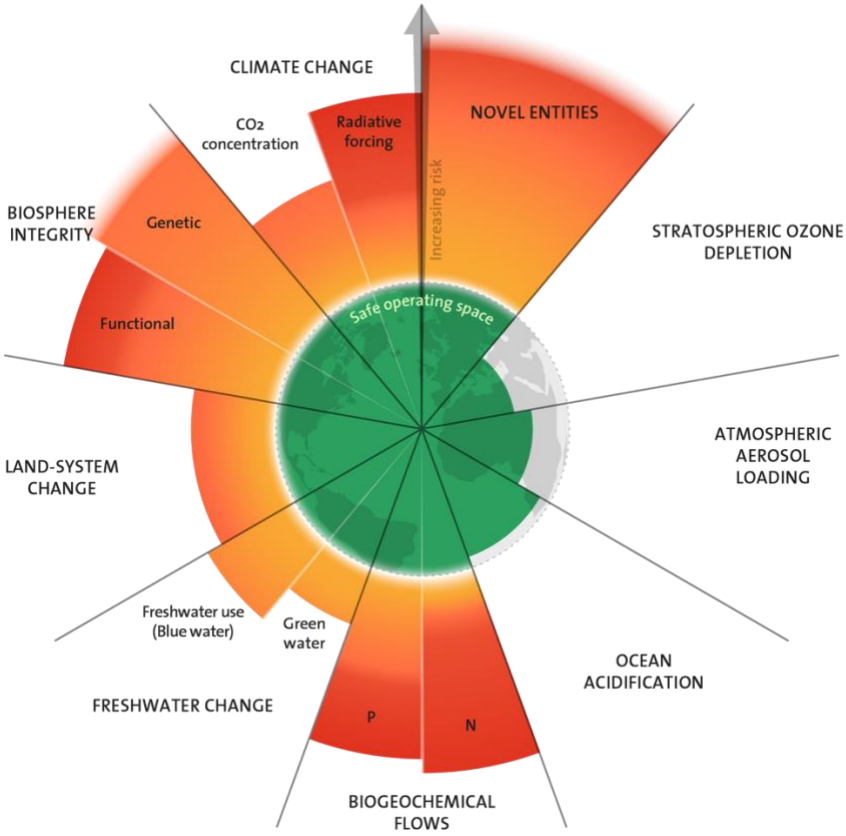
An elucidation is, therefore, required. Formally, the term *sustainability* refers to the ability of a factor to be maintained at a certain rate or level, during a preestablished timeframe[8]. Linking this to the *Anthropocene*[9] era we are witnessing, the magnitude preservation that the definition implies refers to the nine Planetary boundaries, namely: a) climate change, b) biosphere integrity (biodiversity), c) stratospheric ozone, d) atmospheric aerosol, e) ocean acidification, f) biochemical flows, g) land system change, h) freshwater use, and i) novel entities. **Figure 1**, shown below, reports a schematized representation of such boundaries, their specific composition and the level of transgression six of them reached in 2023.

From such clarification, sustainability may then be considered as the mere avoidance of depletion of natural resources in order to maintain an ecological balance[10]. In synthesis, being sustainable could be ultimately described as the quality of causing little or no damage to the environment and therefore being able to continue to produce, consume and invest for a long time[11]. By acting according to these principles, the so-called *environmental ceiling* would be respected, and a safe space for humanity

[3] UN General Assembly Economic and Social Council. (2024). *Progress towards the Sustainable Development Goals: Report of the Secretary-General* (A/79/79-E/2024/54), page 3. United Nations. https://unstats.un.org/sdgs/files/report/2024/SG-SDG-Progress-Report-2024-advanced-unedited-version.pdf
[4] UN General Assembly Economic and Social Council, (2024), page 4.
[5] The Compliance Scale is an instrument the UN uses to rank Member States according to their total progress made towards achievement of all 17 SDGs. The overall score given to a specific country is composite and takes into consideration three frameworks: current analysis, trend analysis and forecasting. According to this scale if one obtains a score ranging from 0 to 49 is an Aspirant, from 50 to 64 it is a Performer, from 65 to 99 it a Frontrunner and if it reaches a score higher than 99 out of 100 it is an Achiever. Regarding last published ranking, Finland is the country who received the highest score of 86.35.
[6] See President Donald Trump removing the United States (second biggest greenhouse emitter) from Paris Agreement.
[7] Rephrasing Robert Swan's sentence "The greatest threat to our planet is the belief that someone else will save it. […] The last great exploration on earth is to survive on earth." *International Antarctic Expedition*, from 1st March 2012 to 11th March 2012. Robert Swan (1956) is a polar explorer, specifically the first person to walk to both poles, and presently an advocate for the protection of Antarctica and the advancement of renewable energy. Swan is also the founder of 2041, an organization committed to the preservation of the Antarctic,
[8] Definition acquired from Oxford Languages. Retrieved 11 March 2025, from https://languages.oup.com.
[9] A non-formal unit of Geologic Time Scale considered an invaluable descriptor of human impact on Earth's system. IUGS. (2024). The Anthropocene. In https://www.iugs.org. IUGS- International Union of Geological Sciences. https://www.iugs.org/_files/ugd/f1fc07_40d1a7ed58de458c9f8f24de5e739663.pdf?index=true
[10] Definition acquired from Oxford Languages. Retrieved 11 March 2025, from https://languages.oup.com.
[11] Rephrasing definition acquired from Cambridge Dictionary. Retrieved March 12, 2025, from https://dictionary.cambridge.org/dictionary/english/sustainability.

would arise. However, for this humankind's harbor to be fully established, upholding environmental boundaries is not enough: what would be necessary is an inclusive and sustainable economic development built on strong social foundations such as equity, gender equality, peace, resilience, education and health provision.

[Figure 1]: 2023 planetary boundaries framework.



Source: Stockholm Resilience Centre (2023). *Planetary boundaries*. Azote for Stockholm Resilience Centre, based on analysis in Richardson et al 2023.
https://www.stockholmresilience.org/research/planetary-boundaries.html

Sustainability, rather than solely based on climate-related considerations, is indeed a relatively complex concept born from the intersection of three pivotal dimensions, each equally important: economic, environmental and social. The most complete and accredited definition of sustainability was given in 1987: "*Sustainability is meeting the needs of the present without compromising the ability of future generations to meet their own needs*"[12]. This contributed in highlighting a new crucial element deeply rooted in the concept of sustainability: time. Sustainable development[13] is, consequently, a transversal and timeless objective the nature of which embodies all macro-areas of our existence on this planet.

[12] Reformulation of United Nations Brundtland Commission (1987). *Report of the World Commission on Environment and Development: Our Common Future,* page 16. Retrieved March 12, 2025, from http://www.un-documents.net/our-common-future.pdf.
[13] Please note that the terms *Sustainability* and *Sustainable Development* are used interchangeably, and they refer to the same concept.

Sustainability, as a guiding ideal, stretches far beyond its practical manifestations to evoke a profound philosophy of coexistence and continuity. It is the quiet insistence that human progress should not neglect the delicate balances that enable life itself, that growth must honor the rhythms of nature, respect social cohesion, and safeguard the inheritance of generations yet to come. Sustainability unfolds as an ongoing commitment: a measured choreography between consumption and conservation, innovation and restraint. Given its relatively multifaceted character, its realization appears complex and arduous. However, one of the most effective ways to achieve sustainability and a promising tool to obtain tangible results is Sustainable Finance.

1.2 The relevance of Sustainable Finance

As acknowledged previously, there are crucial discrepancies between how our markets — financial and non-financial — are organized and the concept of sustainability. The world's system of production is merely capitalist[14], and consumers' tendencies are mainly materialistic. Such economic system has substantial harmful repercussions on the planet's ecosystem, given the considerable levels of waste, pollution and global warming created by all parties. This traditional relationship between economic and environmental systems could be described as a one-sided liaison: the Earth gives resources — renewable and non-renewable — and by using them, the world's population is ultimately able to produce and consume at a rate so high that the utmost result is pollution and disruption.

Unfortunately, from this dynamic has origin a never-ending cycle, since even if the problem is recognized, it is never really fully addressed. The reason why, resides in the mere profit-oriented nature of firms and from its origin and derivation: Milton Friedman, in 1970, published an essay called "*The Friedman Doctrine: The Social Responsibility of a Business is to Increase its Profits*" in which he stated his theory, according to which the main duty of a company was to maximize revenues and shareholders' dividends[15]. Such belief, gone down in history as the *shareholder value doctrine*, implies that no business is compelled to engage in any social responsibility activity unless its shareholders are willing to do so. This *pervasive ideology* [16] is now considered the Bible of business life and is the reason why today's individualistic and selfish corporate behavior eclipsed the socially conscientious conduct that companies should apply. What this doctrine, and its other derivatives, have been able to sow since the informatization era[17] are real and tangible threats regarding environmental damage, income inequality, and lack of corporate social responsibility, leading to the attainment of disrupted markets, which appear to be incompatible with the concept of sustainability.

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[14] Note that in this case the term *capitalist* refer to the capitalist attitude adopted by the production sector. In more depth, for capitalist attitude we intend a mindset that embraces the principles of private ownership of the means of production, free markets, and the pursuit of profits as a primary motivator. Being capitalist often involves valuing competition, individual initiative, and the idea that the free market can efficiently allocate resources and drive economic growth. In particular what it is stressed in the text is the profit maximizing and asset accumulating tendencies of the production sector.

[15] "There is one and only one social responsibility of business — to use its resources and engage in activities designed to increase its profits." Milton Friedman, 13 September 1970, *The New York Times*. Retrieved 15 March 2025, from https://graphics8.nytimes.com/packages/pdf/business/miltonfriedman1970.pdf.

[16] As defined by Harvard Business School professors Joseph L. Bower and Lynn S. Paine *in The error at the heart of corporate leadership*. (2017). Harvard Business Review. Retrieved 5 April 2025, from https://hbr.org/2017/05/the-error-at-the-heart-of-corporate-leadership.

[17] Economic development era (from 1975) whose basic resource was information, and its primary focus was rationalization and efficiency.

However, a few exceptions emerged in those same years, which not only strongly opposed the popular Friedman doctrine, but laid the foundation for modern and posthumous business models. In particular, Michael Porter's *Competitive Strategy*[18] marked a decisive shift in strategic management by framing business success not merely as the pursuit of profit maximization, but as the outcome of a firm's structured positioning within its industry. By introducing the Five Forces framework, Porter conceptualized competition as a systemic and multi-dimensional phenomenon, whereby firms could achieve sustained competitive advantage through deliberate strategic choices — such as differentiation or cost leadership — rather than simply relying on market forces to dictate outcomes. This approach challenged Milton Friedman's view of the firm as a profit-maximizing entity primarily accountable to shareholders, by emphasizing strategic intentionality and the capacity of firms to shape, rather than passively absorb, their competitive environment.

Edward Freeman's *Strategic Management: A Stakeholder Approach*[19] further expanded the strategic horizon by arguing that firms are embedded in a complex web of relationships with multiple stakeholders, whose interests must be actively managed if long-term value is to be sustained. Freeman's stakeholder theory represented a departure from the dominant Friedmanite logic of the early 1980s, which posited that managerial responsibility is confined to maximizing returns for shareholders. Instead, Freeman contended that corporate success depends on balancing and integrating the expectations of all those who affect or are affected by the firm, thereby laying the foundations for contemporary notions of corporate responsibility and sustainability.

Following this specific line of thought, in recent times, for the purpose of contrasting this short-termism[20] era, and of preventing the protection's despoliation of society and environment (to which *shareholder primacy* ultimately leads, through long-term economic harms and perils of financial crises)[21] a new theoretical approach gained popularity in the business world: *Stakeholder pre-eminence*. Such theory conjugates stakeholder capitalism with ESG[22] principles and defines the combination of these as the key to sustainable, broad-based, prosperity[23]. Specifically, as the Davos Manifesto[24] elucidates, a company's goal is to involve all of its stakeholders in the production of shared, long-term value. A business benefits all its stakeholders — employees, clients, suppliers, local communities, and society — by generating such value as well as serving its shareholders. A

[18] Michael Porter (1980). *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. New York: The Free Press.
[19] Edward Freeman (1984). *Strategic Management: A Stakeholder Approach*. Boston, MA: Pitman.
[20] "Short-termism refers to an excessive focus on short-term results at the expense of long-term interests. Short-term performance pressures on investors can result in an excessive focus on their parts on quarterly earnings, with less attention paid to strategy, fundamentals and long-term value creation." *Short-Termism*. (2019, October 29). Chartered Financial Analyst (CFA) Institute Research and Policy Center. Retrieved 25 March 2025 from https://rpc.cfainstitute.org/policy/positions/short-termism#:~:text=Short%2Dtermism%20refers%20to%20an,and%20long%2Dterm%20value%20creation.
[21] The Harvard Law School Forum on Corporate Governance. (2020, September 17). *The Friedman Essay and the true purpose of the Business Corporation*. Retrieved 20 March 2025 from https://corpgov.law.harvard.edu/2020/09/17/the-friedman-essay-and-the-true-purpose-of-the-business-corporation/.
[22] Shortened version of Environmental, Social Governance.
[23] The Harvard Law School Forum on Corporate Governance, 2020. See former footnote.
[24] Schwab, K. (2019). *Davos Manifesto 2020: The Universal Purpose of a Company in the Fourth Industrial Revolution.* World Economic Forum. Retrieved 5 April 2025, from https://www.wlrk.com/docs/WEF-_Davos_Manifesto_2020.pdf.

common commitment to decisions and policies that support a company's long-term success is the most efficient method to comprehend and balance the conflicting interests of all stakeholders.

The application of the Friedman Doctrine results, then, not only old-fashioned, since shareholders' interest can no longer be considered monolithic but rather divergent, and more prone to wider time horizons and sustainable-friendly impacts; but also simplistic, given its impossibility to relate to a dramatically changed corporate world since the 1970s. Nowadays, the business environment is (or at least should be) imbued with what could be called a *New Paradigm* framework[25], that has its roots in three main focal pillars:

a) *Governance* refers to the framework of relationships between a corporation and its shareholders as well as the dynamics between the executive management and the board of directors. By adhering to the fundamental principles of sound governance and fostering transparent, constructive engagement with shareholders, companies can demonstrate the presence of diligent, deliberative boards that provide oversight of prudent, long-term strategic direction.

b) *Engagement* refers to the reciprocal exchange of information and perspectives between a corporation and its shareholders. It is characterized by dialogue rather than unilateral directives, emphasizing a mutual commitment to open, constructive communication. This process involves both parties — companies and shareholders — actively addressing matters that bear on the firm's long-term value, while ensuring sufficient access to facilitate enduring relationships. Corporations are expected to respond attentively to shareholder concerns, whereas shareholders, in turn, are encouraged to articulate their priorities and expectations proactively and transparently.

c) *Stewardship* denotes the relationship between shareholders, particularly asset managers and institutional investors, and the companies in which they hold ownership interests. It embodies a fiduciary responsibility on the part of investors to act in the best interests of the ultimate beneficiaries whose capital they manage, and to exercise their shareholder influence in support of sustainable, long-term value creation. By adhering to stewardship principles, investors and asset managers seek to gain a comprehensive understanding of a company's governance structures and strategic direction, while committing to constructive engagement as the principal mechanism for addressing deficiencies in corporate strategy or performance.

In view of these three pivotal areas, today's purpose of a company could then be described as conducting a lawful, ethical, profitable and sustainable business in order to ensure its success and grow its value over the long term[26]. Such corporate intention stems from what is ultimately recognized as Sustainable Finance, which the EU defines as the "process of taking environmental, social and

[25] The New Paradigm: A Roadmap for an Implicit Corporate Governance Partnership Between Corporations and Investors to Achieve Sustainable Long-Term Investment and Growth, by Martin Lipton, Steven A. Rosenblum, Sabastian V. Niles, Sara J. Lewis and Kisho Watanabe, World Economic Forum, 2 September 2016.
[26] The Harvard Law School Forum on Corporate Governance, 2020. See footnote 21.

governance considerations into account when making investment decisions in the financial sector, leading to more long-term investments in sustainable economic activities and projects"[27].

However, it would be rather simplistic to acknowledge Sustainable Finance only in a business-operational oriented way, since it would give a narrow denotation to the notion. In order to grasp the real essence of this concept, a macroeconomic interpretation is needed to obtain a broader and more complete definition. It is then necessary to make use of the so-called Impact Equation[28]:

$$\frac{Ny}{\alpha} = G(S) \quad [29]$$

This formula describes the relation between aggregate demand per unit of time $\left(\frac{Ny}{\alpha}\right)$ and the aggregate supply $G(S)$, putting particular emphasis on the biosphere's regenerating ability and how, in turn, biosphere-derived goods and services are transformed into waste. Analyzing such formula, we are able to establish Finance's fundamental role in *determining both the stock of natural capital and the extent of human demands on the biosphere*[30] and, thus, how it is capable of affecting both sides of the equation.

On the supply side of the Impact Equation, Finance enables investments in biodiversity restoration and ecosystem conservation. The regenerative rate of our natural capital stock is increased by financial investments. On the demand side of the equation, Finance impacts human needs with the redirection of funds to varying sections of the real economy. In addition, Finance impacts the effectiveness of our utilization of the biosphere by directing flows to facilitate research and development. This is the gist of what is defined as Sustainable Finance. Informally, it is possible to describe Sustainable Finance as a part of our distorted capitalist markets devoted to the reparation of damage created by this same apparatus*: the system cheating the system for a good cause*.

In this approach, Sustainable Finance does not emerge as a marginal demand voiced by uncompromising environmental activists or as a discretionary luxury affordable only to affluent nations and privileged consumers. Rather, it stands at the very core of efforts to revitalize the integrity of contemporary markets by re-anchoring financial activity in principles of fairness, transparency, and long-term value creation. By systematically integrating environmental and social considerations into the allocation of capital, Sustainable Finance seeks to correct the distortions that have long allowed short-term profit-seeking to externalize costs onto communities and ecosystems. In doing so,

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[27] Definition acquired from European Commission website. Retrieved 14 March 2025, from https://finance.ec.europa.eu/sustainable-finance/overview-sustainable-finance_en#:~:text=sustainable%20finance%20framework-,What%20is%20sustainable%20finance%3F,sustainable%20economic%20activities%20and%20projects.

[28] Dasgupta, P. (2021). *Final report - The Economics of Biodiversity: The Dasgupta Review*. Page 117. GOV.UK. https://www.gov.uk/government/publications/final-report-the-economics-of-biodiversity-the-dasgupta-review.

[29] Dasgupta (2021), page 118. Refer to previous footnote.
N represents human population, y describes human economic activity per capita, α is the efficiency with which the biosphere's goods and services are converted into GDP and the extent to which the biosphere is transformed by our waste products. $G(S)$ is a function describing how the rate at which the biosphere regenerates with respect to the stock of the biosphere.

[30] Dasgupta (2021), page 467.

it elevates finance from a passive channel of monetary flows to an active instrument of economic governance — one capable of guiding investment toward truly productive activities that generate shared prosperity while safeguarding the ecological and social foundations upon which all markets ultimately depend.

More formally, Sustainable Finance could be described as finance fostering sustainable economic, social and environmental development. Expanding even further the definition, we ultimately arrive at this notion delineation: "Sustainable Finance is a financial system that is stable and tackles long-term education, economic, social and environmental issues, including sustainable employment, retirement financing, technological innovation, infrastructure construction and climate change mitigation."[31]

1.3 Tools, Methods and Processes to Invest Sustainably

In the realm of Sustainable Finance, a diverse array of tools, methodologies, and procedural approaches has emerged, enabling individuals to evaluate and determine which investments align most closely with their objectives. However, despite this methodological plurality, such mechanisms are, to a significant extent, subordinate to the investor's underlying beliefs, values, and intentions (both financial and non-financial). In essence, the effectiveness of Sustainable Finance in directing capital toward sustainability-oriented outcomes is intimately connected to the investor's subjective understanding of how particular investments are capable of producing real-world impact in specific thematic or geographic areas. This subjective dimension shapes the criteria by which sustainability is interpreted and operationalized. Consequently, the alignment between financial capital and individual or institutional values is not merely a technical matter of selecting compliant assets but a reflective process rooted in normative judgments. It is through this alignment that Sustainable Finance aspires to contribute meaningfully to the broader systemic transformation toward a more resilient, equitable, and environmentally sustainable economy.

For instance, consider an individual investor who is deeply concerned about climate change and prioritizes environmental sustainability in their financial decisions. This investor may choose to allocate capital exclusively to green bonds issued by renewable energy companies, such as those financing solar or wind infrastructure projects. While a wide array of sustainable investment instruments is available, the investor's personal conviction regarding the urgency of decarbonization shapes both the choice of the financial product and the evaluation of its impact. In this case, the investor perceives the direct financing of clean energy infrastructure as the most effective pathway to contribute to the broader transition toward a low-carbon economy. Simultaneously, this decision reflects a synthesis of financial objectives and non-financial intentions, including ethical responsibility and long-term environmental stewardship.

Irrespective of the specific example considered, the inherent complexity of the ***processes*** associated with sustainable investment remains a central and defining feature. Achieving sustainable investment outcomes can be understood as the result of a series of structured and iterative procedures through

[31] ORF [Observer Research Foundation] (2021). *Raisina Files 2021: A viral world: Can we respond?* (S. Saran & P. L. John, Eds.). ORF.

which investors are able to methodically identify, integrate, and monitor — next to traditional economic-financial factors — environmental, social, and governance factors across the entirety of the investment lifecycle. This process-oriented approach underscores the need for ongoing assessment and refinement, ensuring that sustainability considerations are not merely additive but embedded within the core of investment decision-making and portfolio management practices. The process typically begins with *sustainability due diligence*, which entails the identification and evaluation of material ESG risks and opportunities associated with a given asset or issuer. This phase often involves both quantitative data analysis — relying on ESG metrics, ratings, and sustainability disclosures — and qualitative assessments, including stakeholder engagement and sector-specific context analysis.

Following due diligence, investors proceed to the *integration of ESG criteria into portfolio construction and asset allocation*, ensuring that investment choices align with defined sustainability goals without compromising financial performance. This stage may involve the use of ESG benchmarks or sustainability indices to guide allocation decisions and manage exposure to non-aligned sectors. *Risk management frameworks* are then employed to monitor ESG-related risks over time, incorporating scenario analysis, stress testing, and climate-related financial disclosures (e.g., those recommended by the Task Force on Climate-related Financial Disclosures, TCFD[32]).

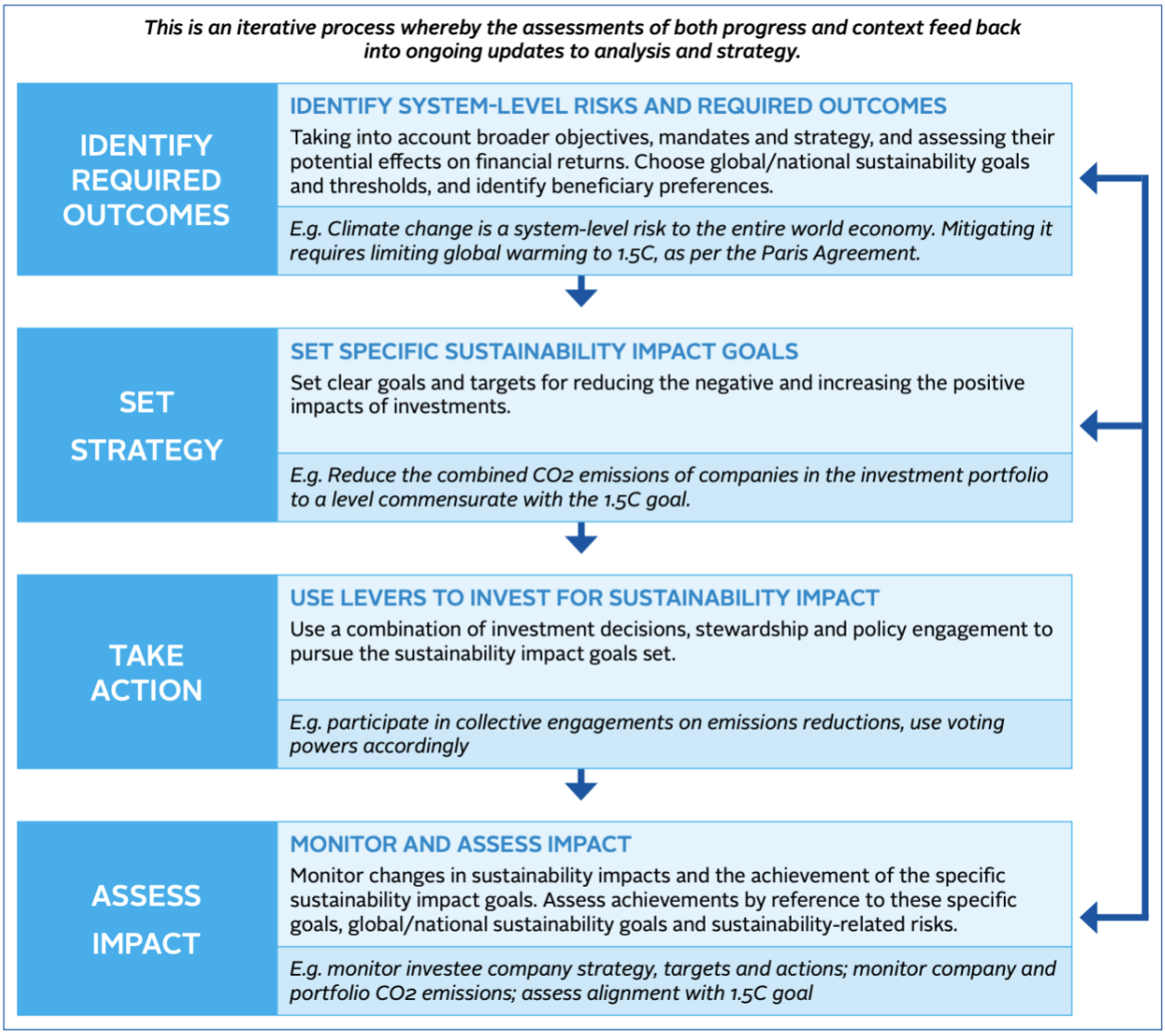
Once investments are in place, ongoing *stewardship and active ownership practices* become essential, including proxy voting, direct engagement with company management, and the submission of shareholder resolutions aimed at enhancing ESG performance and accountability. Another crucial component is *transparency and reporting,* whereby institutional investors and asset managers disclose the sustainability characteristics and impacts of their portfolios in compliance with regulatory standards such as the EU Sustainable Finance Disclosure Regulation (SFDR) or the Corporate Sustainability Reporting Directive (CSRD), discussed in more depth further on.

Additionally, sustainable investment processes often require *periodic review and recalibration*, enabling investors to respond to emerging ESG risks, regulatory developments, and evolving stakeholder expectations. Through these interlinked and dynamic processes, sustainable investment becomes an ongoing exercise in aligning capital allocation with long-term value creation and broader environmental and social objectives. By systematically identifying patterns and formalizing procedural elements, it is possible to create a generalization of the course of sustainable investing composed of four main passages (alternatively formulated in **Figure 2**):

[32] The Task Force on Climate-related Financial Disclosures (TCFD) is an international body established to develop consistent, comparable, and decision-useful recommendations for companies to disclose climate-related financial risks and opportunities. Its purpose is to improve the quality and transparency of climate-related reporting so that investors, lenders, insurers, and other stakeholders can better assess the financial implications of climate change on firms and markets. The TCFD was created in December 2015 by the Financial Stability Board (FSB) — an international organization that monitors and makes recommendations about the global financial system based at the bank of international settlements — following a request from the G20 Finance Ministers and Central Bank Governors. The Task Force was chaired by Michael R. Bloomberg, founder of Bloomberg L.P. and former mayor of New York City, who guided its work toward creating a voluntary disclosure framework structured around four core elements: governance, strategy, risk management, and metrics & targets. Michael R. Bloomberg was appointed at the request of Mark Carney (at the time Chairman of the FSB) and now prime minister of Canada. For more information consult https://www.fsb-tcfd.org/#:~:text=The%20TCFD%20has%20developed%20a,through%20their%20existing%20reporting%20processes.&text=Disclose%20the%20organization's%20governance%20around%20climate%2Drelated%20risks%20and%20opportunities.

1. Identify the investor's overarching objectives, encompassing personal values and convictions, targeted financial returns, and the manner in which desired sustainability outcomes both inform and derive from these intentions.
2. Establish concrete sustainability objectives that are coherent with the investor's articulated intentions and value framework.
3. Implement the strategy through a combination of mechanisms, including capital allocation, active ownership and stewardship, and engagement in relevant policy processes, recognizing that these tools are most effective when employed in an integrated manner.
4. Monitor and disclose progress, employing rigorous measurement frameworks to evaluate both financial performance and real-world sustainability outcomes.

[Figure 2]: Illustrated Process of Sustainable Investment



Source: PRI (November 2024), *Investing for Sustainability Impact*, page 7. PRI.

Following the conceptualization of sustainable investment as a complex and continual process, it becomes essential to examine the ***tools and instruments*** through which such processes are operationalized. These mechanisms serve as the practical means by which sustainability objectives are translated into actionable investment strategies. They encompass a wide spectrum of financial products, analytical frameworks, and evaluative standards that collectively facilitate the integration of ESG considerations into investment decision-making.

One of the foundational tools in this domain is the use of *ESG ratings and data,* provided by specialized agencies such as MSCI[33], Sustainalytics[34] and ISS ESG[35], which offer structured assessments of companies' ESG performance and risk exposure. These metrics, while varying in methodology, assist investors in evaluating non-financial risk and identifying firms with strong sustainability credentials.

Another critical instrument is the *taxonomy classification system* (core of this whole thesis and analyzed in depth further on), which offers a standardized, science-based framework for determining whether specific economic activities can be deemed environmentally sustainable. This classification enables investors to align their portfolios with regulatory definitions of sustainability and enhances market transparency.

Additionally, *labelled fixed-income products*, including green bonds, social bonds and sustainability-linked bonds, have become prominent instruments for channeling capital directly into projects with defined environmental or social benefits. These instruments are often guided by internationally recognized frameworks such as the Green Bond Principles by ICMA (International Capital Market Association) or the EU Green bond standard, which specify use of proceeds, project evaluation, and post-insurance reporting.

Further, *impact measurement and reporting frameworks*, such as the Global Impact Investing Network's IRIS+ system[36] or the Sustainability Accounting Standard Board (SASB) standards[37], provide methodologies for quantifying and communicating the social and environmental outcomes of investments.

Building on this foundation, the subsequent analytical focus turns to the ***methods*** by which such investments are chosen. The selection of sustainable investments is not merely a technical exercise, but rather a methodologically rigorous process grounded in normative criteria, strategic objectives,

[33] MSCI (formerly known as *Morgan Stanley Capital International*) is a global provider of financial market indices, analytics, and investment decision-support tools. It is best known for its MSCI indices, which are widely to measure the performance of global equity markets or specific market segments. https://www.msci.com.
[34] Sustainalytics is a leading global provider of *environmental, social, and governance (ESG)* research, ratings, and data used by investors to assess the sustainability performance and risk exposure of companies and financial instruments. Since 2020, Sustainalytics has been a wholly owned subsidiary of Morningstar, further expanding its reach in servicing the sustainable finance and responsible investment markets. https://www.sustainalytics.com.
[35] ISS ESG is the environmental, social, and governance *(ESG)* research and ratings division of Institutional Shareholder Services (ISS) a major global provider of corporate governance, proxy voting, and responsible investment solutions. https://www.issgovernance.com/sustainability/.

[36] Developed by Global Impact investing Network (GIIN)
[37] Part of the Value Reporting Foundation merged into the IFRS Foundation

and contextual constraints. There is a multitude of strategies that ultimately direct individuals to the optimal investment to pursue; for this reason it might be helpful to make use of a scheme to visualize such diversification better. As presented in **Figure 3**, investment strategies branch out in two main areas consisting in ESG Incorporation and Stewardship.

[Figure 3]: Visualization of Sustainable Investment Methods

Source: Pri. (2025, June 19). *An introduction to responsible investment*. PRI. https://www.unpri.org/introductory-guides-to-responsible-investment/what-is-responsible-investment/4780.article

ESG Incorporation refers to the systematic assessment, consideration, and integration of environmental, social, and governance factors within established investment processes. This practice entails embedding ESG-related risks and opportunities into financial analysis and decision-making, typically through one or a combination of the following approaches:

1. *Screening,* which substantially involves the application of filters to a defined universe of financial instruments to determine their eligibility for inclusion in an investment portfolio. These filters are typically guided by predetermined criteria, which may reflect the investor's values, strategic preferences, or specific performance indicators articulated within the investment strategy or aligned with a client or fund mandate. Screening can take various forms, including positive/best-in-class screening (selecting investments that demonstrate superior ESG performance), norms-based screening (assessing compliance with international standards and conventions), and negative/exclusionary screening (excluding assets that do not meet certain ethical, environmental, or social thresholds).

2. *ESG Integration,* which involves the explicit incorporation of ESG factors into traditional financial analysis and investment processes, under the premise that these factors are material to long-term risk-adjusted returns. Unlike exclusionary approaches, ESG integration does not necessarily avoid specific sectors or companies but instead adjusts valuations and investment decisions in light of ESG-related risks and opportunities.

3. And lastly, *Thematic Investing*, which pertains the act of focusing on long-term sustainability trends such as renewable energy, water management, sustainable agriculture, or gender equity, and targeting investments in firms whose core business activities align with these themes. *Impact investing* further advances the sustainability agenda by intentionally targeting investments that generate measurable positive social

or environmental outcomes alongside financial returns; this method is particularly prevalent in private markets and emerging economies, often aligning with the United Nations Sustainable Development Goals.

The other branch of methods for sustainable investing consists in what is defined as *Stewardship.* Although the concept was briefly introduced in the preceding sub-chapter, it is necessary to redefine it, as the change in context alters its connotation to some extent. In this case indeed, Stewardship refers to the responsible exercise of influence by investors to safeguard and enhance long-term value creation. This encompasses not only financial returns for clients and beneficiaries but also the preservation and improvement of shared economic, social, and environmental assets upon which those returns ultimately depend.

One of the principal mechanisms through which stewardship responsibilities are enacted is engagement, which entails purposeful interaction between investors and current or prospective investees, as well as other relevant stakeholders. These interactions aim to promote enhanced ESG practices, advance sustainability-related outcomes, or improve the quality and transparency of corporate disclosures. In the context of private markets, engagement further encompasses direct communication and influence over management teams or boards, reflecting the greater control often afforded to investors in such settings.

Stewardship activities are not confined solely to investee entities such as companies, issuers, or assets. They may also extend to broader stakeholder groups, including policymakers, regulatory authorities, and standard-setting bodies, thereby contributing to systemic improvements in sustainability governance and financial market integrity.

1.4 Principles of Sustainable Investment Practice

In order to fall within the spectrum of Sustainable Finance, there are certain benchmarks that must be upheld. Firstly, it is imperative to recognize investments as one of the primary vehicles through which Sustainable Finance is attainable, alongside the "greening" of the financial sector. Naturally, as the concept's definition necessitates, such investments should be part of the ESG and SDG framework, adhere to responsible practices and should be at investors' own discretion. However, additional principles were formalized to better contribute in the development of a sustainable and global financial system. These six aspirational principles, better known as *The Principles*, were first theorized by PRI (Principles for Responsible Investment[38]): a United Nations-supported global network of financial institutions whose ultimate goal is reducing ESG issues affecting portfolio strategies, while aligning signatories with decisive long-term sustainable objectives for society. PRI commits to such principles while respecting their fiduciary duties to investors. What follows is a cursory evaluation of the PRI statements regarding such topic[39].

[38] Also known as UNPRI

[39] All that following references to PRI six principles were re-elaborated from PRI, (2024, August 6). *What are the Principles for Responsible Investment?* PRI. https://www.unpri.org/about-us/what-are-the-principles-for-responsible-investment. Retrieved March 17, 2025.

Principle 1 entails the incorporation of *ESG issues into investment analysis and decision-making processes.* To better comply with this principle, PRI suggests taking different actions such as supporting the development of ESG-related tools, metrics, and analyses; assessing the capabilities of external and internal investment managers to incorporate ESG issues; and asking investment service providers to integrate ESG factors into evolving research and analysis. Furthermore, particular emphasis is put on aspects regarding academic research and training for investment professionals on this theme.

Principle 2 expresses the signatories' commitment in being *active owners and incorporating ESG issues into ownership policies and practices.* This entails the development and disclosure of active ownership policy consistent with *the Principles,* and the participation in collaborative engagement initiatives.

Principle 3 manifests the intention of *seeking appropriate disclosure on ESG issues by the entities in which investments are made*. Possible alternatives to adhere to such principle could be asking for standardized reporting on ESG issues[40] or asking for ESG issues to be integrated within annual financial reports.

Principle 4 reports the determination *to promote acceptance and implementation of the Principles within the investment industry* and invites investors to communicate ESG expectations to investment service providers as well as revisit relationships with service providers that fail to meet ESG expectations.

Principle 5 presents the plan to *enhance the effectiveness of implementing the Principles* through cooperation and by collectively addressing new emerging related issues.
Finally, **Principle 6**, discloses the intention of unanimously and collectively *report activities and progresses toward the implementation of the Principles*, promoting specifically the use of reporting to raise awareness among a broader group of stakeholders.

Based on PRI's proposal, the complete and absolute fulfilment of these principles would create an economically sustainable and efficient system capable of achieving long-lasting value creation. This system would unequivocally reward responsible investments and investors while enhancing the quality of societal standards. Sustainable Finance would then become the key element for the transition to a sustainable economy.

1.5 The Role of Taxonomies regarding Sustainable Activities

The ultimate guideline investors should consult before deciding to embark on a sustainable investment path is the taxonomy of the investment they would like to pursue. Indeed, taxonomies are the main instruments that grant the label '*sustainable*' to an investment and, in turn, are indispensable capital-recruiting elements. Metaphorically, they could be described as the cornerstone of Sustainable Finance. The importance of taxonomies resides fundamentally in their capacity to encourage financial flows to be allocated to investments that would aid with the economic transition. For this to occur,

[40] Using tools such as the Global Reporting Initiative. As specified in PRI, (2024, August 6). See previous footnote.

taxonomies should be designed most efficiently to maximize funds by providing investors with strong signals and by assisting with decision making aspects via sustainability asset assessment.

In the Sustainable Finance context, then, the term taxonomy refers to a structured and standardized classification system designed to identify and delineate economic activities that can be considered environmentally sustainable. Alternatively, a taxonomy is defined as "a set of criteria that provide the basis for an evaluation of whether and to what extent a financial asset will support given sustainability goals."[41]The primary objective of this instrument, as briefly mentioned before, is to provide a common and standardized (where possible) framework, supported by clear criteria for assessing the environmental performance of investments, thereby enhancing transparency, comparability and consistency across financial markets.

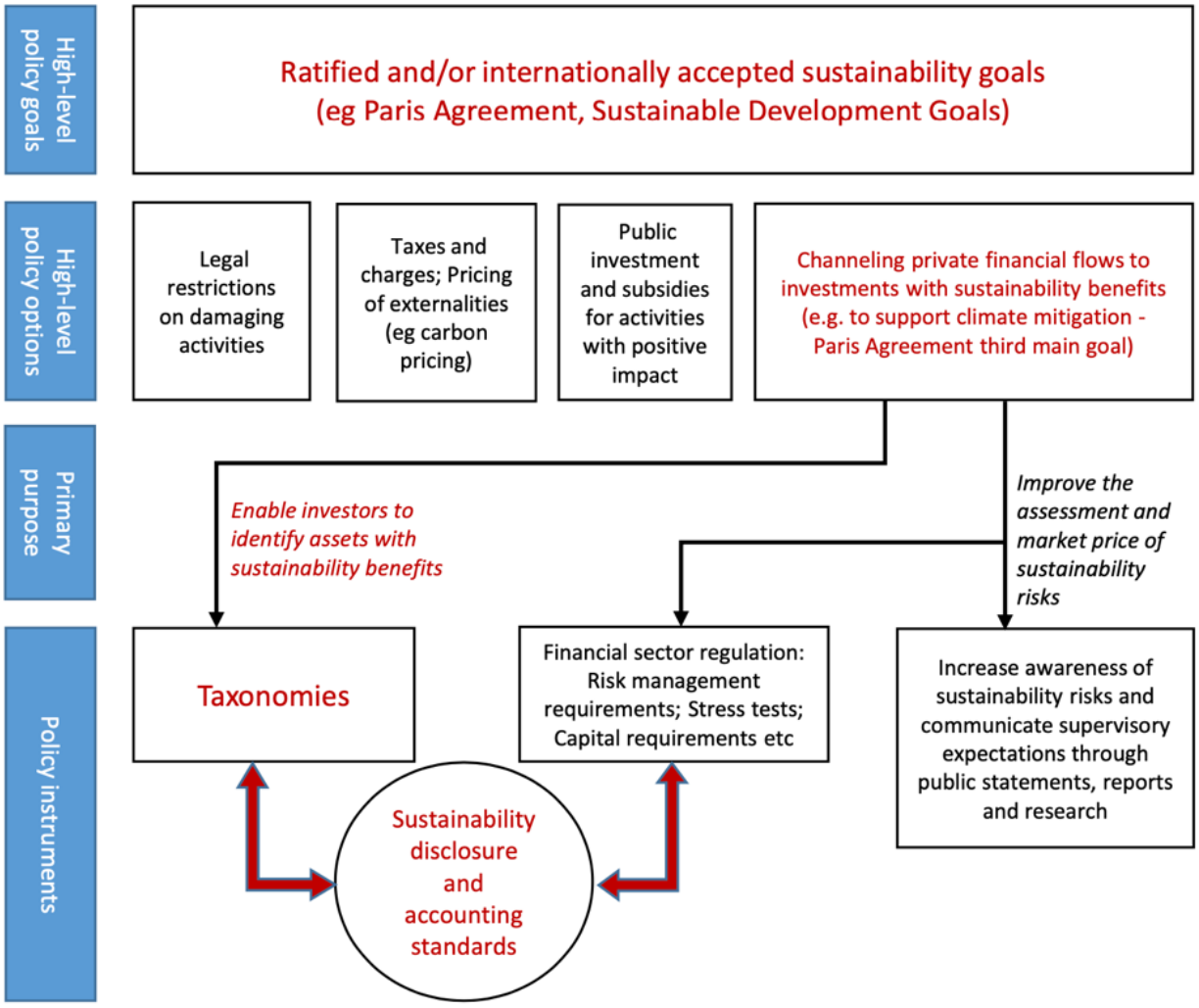
By establishing science-based thresholds and definitions, a taxonomy serves as a guide to capital allocation towards activities that contribute substantively to climate and environmental objectives. It also functions as a regulatory tool to support policy goals, counteract *greenwashing*[42], and align financial flows with broader sustainability targets, including those articulated in the European Green Deal and the United Nations Sustainable Development Goals.

The complex nature of this financial instrument entails an equally challenging and demanding process, formalized in two main steps. Indeed, the development of a sustainable finance taxonomy involves a structured, *multi-stakeholder* procedure typically initiated by regulatory authorities or supranational institutions. This process begins with the establishment of a legislative or policy mandate, followed by the formation of expert working groups usually composed by scientists, economists, financial experts, policymakers, and industry stakeholders (**Stage one**). These groups are tasked with defining the environmental objectives of the taxonomy and formulating technical screening criteria, which could be essentially described as both quantitative and qualitative thresholds that determine whether specific economic activities substantially contribute to those objectives while avoiding significant harm to third parties. Public consultation and impact assessments are often conducted to ensure the robustness, feasibility and legitimacy of the criteria.

Once finalized, the taxonomy is officially formalized through legal instruments such as regulations or delegated acts (**Stage two**). The taxonomy is periodically reviewed to incorporate scientific advancements, technological developments and evolving policy priorities.
To further elucidate the creation process of taxonomies, we take into consideration the following framework, represented schematically in **Figure 5**.

[41] Ehlers, T., Gao, D., & Packer, F. (2021). *A taxonomy of sustainable finance taxonomies* (BIS Paper 118). Bank for International Settlements.
[42] For *greenwashing effect* it is intended the erroneous communication strategies, of certain firms or organizations, aimed at the construction of a false and deceptively positive self-image in terms of environmental impact.

[Figure 5]: Taxonomy evolution as one policy instrument to achieve high-level sustainability goals.



Source: Ehlers, T., Gao, D., & Packer, F. (2021)

A well-designed taxonomy facilitates the mobilization of capital towards asset that advance a nation's long-term sustainable development priorities. Such priorities may encompass, among others, the transition to low-carbon and climate-resilient economy, the conservation of ecosystems and natural resources, and the development of sustainable urban environments. Generalizing, it is possible to state that, dependently on the jurisdiction or area of influence, taxonomies priorities stem from what is called high policy goals, that are ratified or internationally accepted sustainable goals. When the goals of a taxonomy are harmonized with pre-existing national regulations and standards, it enables a smoother integration of those frameworks in the taxonomy system.

To operationalize such high-level policy objectives, as articulated for instance in China's ecological civilization framework, the Paris Agreement or the United Sustainable Development Goals, a science-based methodology is employed. This approach permits the transformation of overarching sustainability ambitions into quantifiable targets (most of the time expressed as a numerical variable, e.g. ratios)

Once established, the taxonomy provides clarity to future investors on how the asset implied in the investment is able to contribute to the achievement of a sustainable future, therefore enabling the measurement of its sustainability degree. A well-structured taxonomy should mainly highlight the non-financial benefits of the investment's asset, avoiding subsequent *greenwashing* effects.

However, it should be emphasized that taxonomies are not, in any way, designed for risk management purposes since they are only aimed at the classification of a single asset and are unable to account for interdependencies between other assets.[43] Investors' interest in assets that are assigned a taxonomy-based label ultimately determines how well taxonomies contribute to sustainability goals. By guaranteeing investors that their money is successfully advancing the sustainable development agenda, well-designed taxonomies can boost investor interest while also enhancing market transparency. Therefore, well-designed taxonomies protect market integrity by making sure that investors can easily identify assets that are unable to provide the sustainability advantages needed for the label. Market integrity is ultimately safeguarded.

[43] Ehlers, T., Gao, D., & Packer, F. (2021).

CHAPTER 2: *Sustainable Finance Taxonomies from a European perspective*

The European Union has firmly positioned itself at the vanguard of global initiatives to embed sustainability at the very heart of the financial system. Guided by a comprehensive regulatory and institutional architecture, the EU has endeavored to harness the transformative power of capital markets in the service of its ambitious environmental and climate policy aspirations. At the core of this endeavor lies the EU Taxonomy Regulation, an emblematic pillar of the broader Sustainable Finance Strategy, which seeks to orchestrate a fundamental reorientation of capital flows toward economic activities that are genuinely aligned with environmental sustainability.

Through a rigorously defined, scientifically grounded, and legally binding classification system, the EU Taxonomy offers more than a mere technical framework: it provides a common language of sustainability, one that speaks with clarity and authority across the diverse landscape of European finance. In doing so, it aspires not only to enhance transparency and combat greenwashing but also to illuminate the path toward a net-zero[44] economy by 2050[45], a horizon that beckons with both urgency and hope.

2.1 Origin and Scope of the EU Taxonomy

The conceptual and institutional genesis of the EU Taxonomy Regulation can be traced back to the European Commission's *Action Plan on Financing Sustainable Growth*[46], published in March 2018. This Action Plan was integrally linked to the European Green Deal, which articulated the EU's strategic ambition to achieve climate neutrality by 2050. Recognizing the indispensable role of the financial system in mobilizing the trillions of euros required for the green transition, the Action Plan called for the development of a common classification system (commonly referred to as a "taxonomy") to identify environmentally sustainable economic activities and investments.

This political and policy commitment was formalized in Regulation (EU) 2020/852[47], known as the Taxonomy Regulation, which was adopted by the European Parliament and the Council on 18 June 2020 and entered into force on 12 July 2020. The regulation signified a paradigm shift by introducing a harmonized, science-based, and legally enforceable framework to define the sustainability of economic activities within the EU. In general, unlike previous voluntary sustainability standards, the EU Taxonomy proposed binding obligations on a broad range of stakeholders, thereby enhancing regulatory certainty and investor confidence.

In addition, the development of the taxonomy framework was significantly shaped by the Technical Expert Group on Sustainable Finance (TEG), which operated between 2018 and 2020. The TEG was

[44] A net-zero economy is an economy where the total amount of GHG produced is balanced by the amount removed from the atmosphere, essentially resulting in no net increase in the amount of greenhouse gasses in the atmosphere.
[45] 11 December 2019, the European Commission presents the *European Green Deal*.
[46] European Commission (2018). *Action Plan: Financing Sustainable Growth*. Brussel
[47] Regulation (EU) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment.

instrumental in elaborating the initial technical screening criteria for economic activities that could be deemed sustainable. These criteria were grounded in scientific evidence and environmental impact assessments, ensuring that the taxonomy rests on robust environmental standards[48]. The TEG was formed by a large majority of financial experts, precisely 34 out of 35, with just the last specialist being an environmental expert. Following the expiration of the TEG's mandate, the Platform on Sustainable Finance (PSF) was established in October 2020.

The Taxonomy Regulation articulates six environmental objectives, which form the bedrock of its classification system:

1. Climate change mitigation;
2. Climate change adaptation;
3. Sustainable use and protection of water and marine resources;
4. Transition to a circular economy;
5. Pollution prevention and control;
6. Protection and restoration of biodiversity and ecosystems.

To qualify as environmentally sustainable under the taxonomy, an economic activity must (i) substantially contribute to at least one of the six environmental objectives; (ii) do no significant harm (DNSH) to any of the other five objectives; (iii) comply with minimum social safeguards in line with international standards such as the OECD Guidelines for Multinational Enterprises and the UN Guiding Principles on Business and Human Rights; and (iv) meet technical screening criteria established via delegated acts.

Nevertheless, a distinction is made between "taxonomy-eligible" and "taxonomy-aligned" activities, which – despite the assonance and the apparent synonymity – outline two very different concepts. Eligibility merely indicates that an activity falls within the scope of the taxonomy; alignment denotes full compliance with the technical screening criteria, DNSH requirements, and minimum social safeguards. Even if of fundamental importance, this distinction has proven critical in allowing stakeholders to gauge the depth of their sustainability integration and enabling more nuanced disclosures.

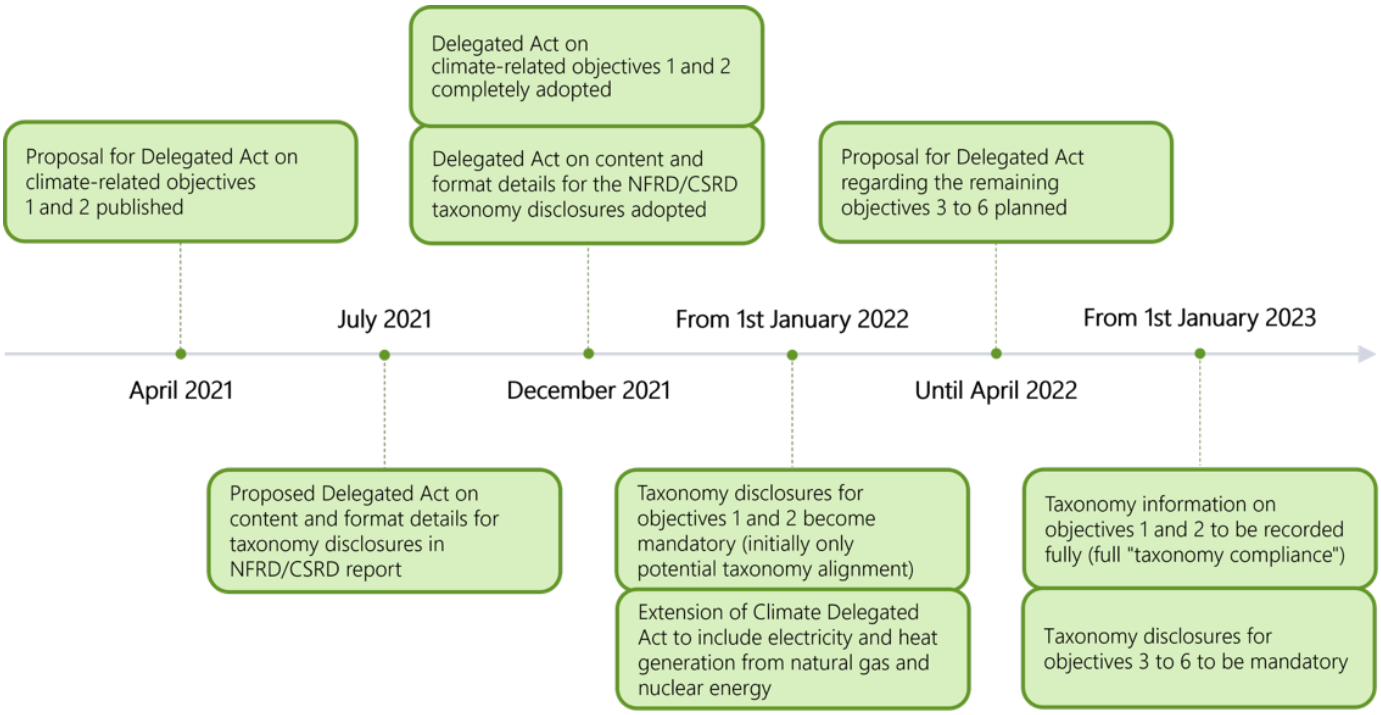
The taxonomy's regulatory articulation has been further developed through in a series of delegated acts. The first, the *Climate Delegated Act*, adopted in June 2021 and applicable as of January 2022, lays out the criteria for activities contributing to climate change mitigation and adaptation. The *Complementary Climate Delegated Act*, which controversially classifies nuclear energy and natural gas as transitional activities[49] under specific conditions, entered into force in January 2023. More

[48] Technical Expert Group on Sustainable Finance (TEG) (2020). EU Taxonomy Technical Report. Brussels.

[49] The Complementary Climate Delegated Act (CDA) expands the EU Taxonomy by conditionally including nuclear energy and natural gas as *"transitional sustainable activities."* Nuclear is recognized for its low CO_2 emissions but only under strict conditions on waste management and safety, with deadlines for new and existing plants. Gas is accepted as a temporary replacement for coal if it meets emissions thresholds (notably 270g CO_2e/kWh), secures permits by 2030, and commits to future use of low-carbon gases. This inclusion was less a scientific decision than a political compromise at the EU Council level: France and several Eastern states pushed for nuclear, Germany and others for gas, while Austria, Luxembourg, and others opposed both. The Commission balanced these opposing interests by recognizing both fuels, ensuring broad political acceptance of the taxonomy but also sparking criticism of "greenwashing" and weakening of climate credibility.

recently, the Environmental Delegated Act, adopted in November 2023 and applicable from January 2024, expanded the taxonomy's scope to include the remaining four environmental objectives. To better summarize the historical "construction" of the EU Taxonomy with a particular regard to the different delegated acts, we refer to **Figure 6.**

[Figure 6]: EU taxonomy Timetable (emphasis on Delegated Acts).

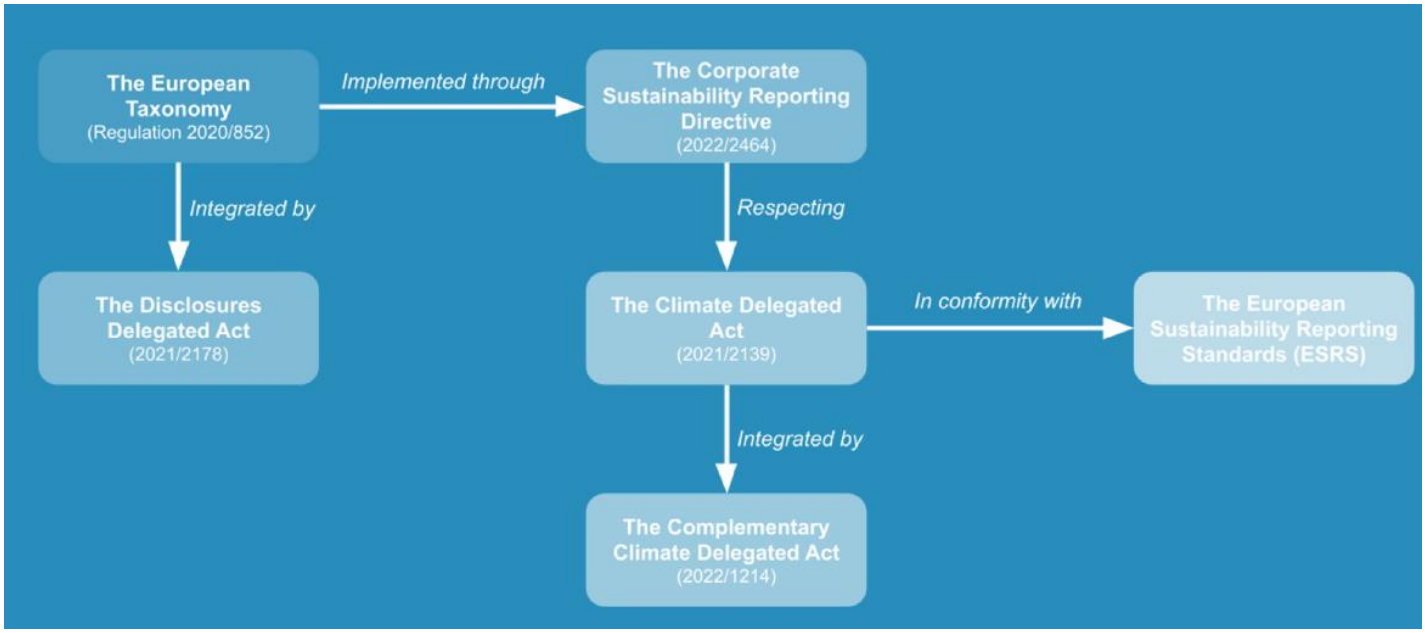


Source: FFE (2024). *What is the EU Taxonomy for Sustainable Activities?* FFE.
https://www.ffe.de/en/publications/info-what-is-the-eu-taxonomy-for-sustainable-activities/

In terms of applicability, the EU Taxonomy extends its reach to a diverse array of stakeholders. These include financial market participants who offer financial products marketed as sustainable; large non-financial and financial undertakings subject to the Non-Financial Reporting Directive[50], and, from 2024 onwards, the Corporate Sustainability Reporting Directive[51]; as well as any issuer of green or sustainable-labelled financial instruments. The integration of the taxonomy with the CSRD notably increases its regulatory breadth, requiring approximately 50,000 companies across the EU to disclose granular information on the taxonomy alignment of their economic activities, including turnover, capital expenditure, and operating expenditure. Ultimately, enhancing clarity, we refer to **Figure 7**, to understand the complete interlinkage between the instruments mentioned.

[50] European Parliamentary Research Service (January 2021). *Non-Financial Reporting Directive (NFRD/2014/95/EU),* European Parliament.
[51] European Commission (2022). *Corporate Sustainability Reporting Directive (CSRD/2022/2464/EU).* European Commission.

[Figure 7]: EU taxonomy Normative Framework.

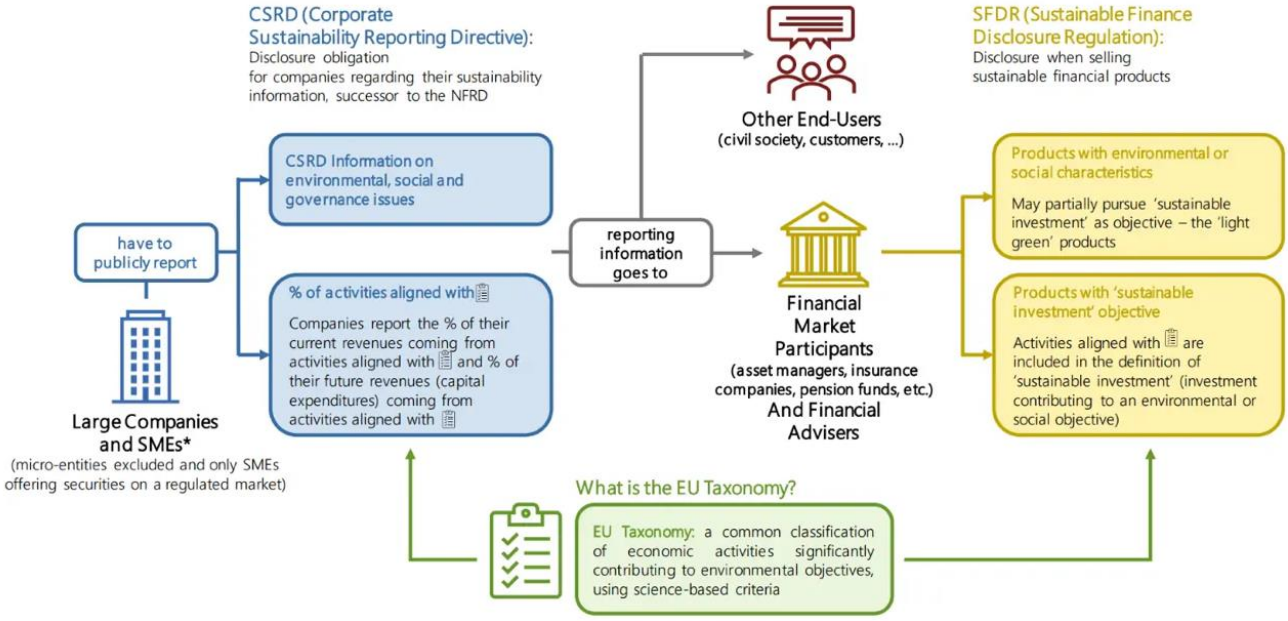


Source: Beatrice De Waal (2023). *The EU Taxonomy Regulation – Part 1*. European Generation

2.2 Regulatory Framework and Governance,

As understood previously, the EU Taxonomy is situated within a broader and increasingly sophisticated regulatory infrastructure designed to foster coherence, comparability, and credibility within the sustainable finance ecosystem. The EU sustainable finance framework is composed of several complementary legislative instruments that collectively form a comprehensive and integrated regulatory architecture. Among these are the Sustainable Finance Disclosure Regulation, which mandates transparency regarding the sustainability characteristics of financial products; the Corporate Sustainability Reporting Directive (mentioned previously), which significantly expands sustainability reporting obligations for companies; the Markets in Financial Instruments Directive II (MiFID II); and the Insurance Distribution Directive (IDD), both of which incorporate sustainability preferences into suitability assessments for retail investors. Together, these instruments aim to reduce market fragmentation, enhance investor confidence, and facilitate the systematic integration of environmental, social, and governance considerations into financial decision-making processes. **Figure 8** shows how these processes take place in the economic environment.

[Figure 8]: EU Sustainable Finance Framework.



Source: FFE. *What is the EU Taxonomy for Sustainable Activities?*
https://www.ffe.de/en/publications/info-what-is-the-eu-taxonomy-for-sustainable-activities/

The governance of the EU Taxonomy is inherently multi-layered, involving a range of institutional actors and expert bodies, and reflects the regulatory complexity and evolving nature of sustainable finance. The European Commission plays a central role in coordinating this framework, possessing the authority to propose and adopt delegated acts and to oversee the implementation and enforcement of the Regulation across all Member States. The governance structure is explicitly designed to balance scientific integrity with democratic legitimacy, ensuring that regulatory decisions are informed by robust technical expertise while remaining subject to public oversight and political accountability. This multi-stakeholder and adaptive approach is crucial for maintaining the credibility and effectiveness of the EU's sustainable finance agenda over time.

A central advisory body within the governance framework of the EU Taxonomy is the Platform on Sustainable Finance (PSF), established under Article 20 of the Taxonomy Regulation. As a specialized expert group, the PSF plays a pivotal role in advising the European Commission on the development and revision of the technical screening criteria. Its composition reflects a broad spectrum of stakeholders, including representatives from civil society, academia, the private sector, and public institutions, thereby ensuring a diversity of perspectives and expertise. This inclusive structure enables the PSF to support the dynamic evolution of the Taxonomy in line with emerging technological developments, scientific evidence, and policy priorities. Comparing such advisory body to what we could informally call its predecessor, namely TEG, it is possible to identify a widened participation in civil society and the industrial community.

At the international level, the European Union has also shown strong leadership in advancing global regulatory coherence. In 2019, it co-founded[52] the International Platform on Sustainable Finance (IPSF), an initiative aimed at fostering interoperability among various taxonomies and sustainable finance frameworks across jurisdictions. This effort is particularly significant given the increasing globalization of capital markets and the proliferation of taxonomy approaches in countries such as China, Canada, and South Africa.

Complementing these initiatives, the Member States Expert Group (MSEG) on sustainable finance serves as a formal mechanism for consulting with and involving EU Member States in the governance process. Through the MSEG, national authorities contribute to the development and evaluation of delegated acts, ensuring that the Taxonomy reflects the diverse legal, economic, and environmental contexts across the Union. Governments have been invited to designate representatives at the expert level, specifically one from their Ministry of Economy or Finance and one from their Ministry of Environment or Climate.

Another important entity involved is the Joint Research Centre (JRC) of the European Commission, which contributes scientific input and impact assessments in support of the technical screening criteria. In addition, the European Supervisory Authorities (ESAs), namely the European Banking Authority (EBA)[53], the European Securities and Markets Authority (ESMA)[54], and the European Insurance and Occupational Pensions Authority (EIOPA)[55], play a critical role in ensuring consistency between the Taxonomy and other regulatory instruments.

This collective effort, encompassing dynamic interplay between political vision, scientific expertise, and regulatory oversight, assures that the core function of the EU Taxonomy is to serve as a compass for reorienting capital flows towards environmentally sustainable economic activities (and later, at least as planned, in a socially sustainable economic activities). By establishing objective and measurable thresholds, the taxonomy helps investors distinguish between genuinely sustainable investments and those that merely claim to be so — a phenomenon commonly referred to as greenwashing. Under the disclosure requirements mandated by the CSRD and SFDR, market participants must annually report the proportion of their economic activities that are taxonomy-aligned. These disclosures encompass key financial indicators such as turnover, Capex, and Opex, and are instrumental in fostering accountability and comparability across sectors and jurisdictions.

Initial implementation results suggest that the taxonomy is beginning to reshape market practices. Between 2023 and 2024, entities reported over 440 billion € in sustainable investments aligned with the taxonomy, with some sectors — such as electricity generation and utilities — achieving alignment

[52] Together with a group of funding partners, namely Argentina, Canada, Chile, China, India, Kenya, and Morocco.
[53] The EBA ensures effective and consistent regulation and supervision of the European banking sector. It develops binding technical standards, conducts stress tests, and promotes financial stability and consumer protection across EU banks.
[54] ESMA safeguards the stability of the EU's financial system by enhancing the protection of investors and promoting stable, orderly markets. It supervises credit rating agencies, trade repositories, and contributes to the development of a single rulebook for EU securities markets
[55] EIOPA supports the stability of the insurance and occupational pensions sectors and protects policyholders, pension scheme members, and beneficiaries. It develops regulatory standards, monitors risks, and fosters supervisory convergence across EU Member States.

rates exceeding 60%.[56] These figures underline the taxonomy's growing influence in mobilizing green capital at scale.

Moreover, the taxonomy enhances the integrity of the EU's sustainable finance ecosystem by providing a standardized framework that underpins other regulatory initiatives. For example, the taxonomy supports the SFDR by ensuring that financial products classified as Article 8 or Article 9 under the regulation can substantiate their sustainability claims. This interoperability strengthens investor protection, mitigates the risk of reputational damage, and reinforces market credibility.

2.3 Debates and Criticisms

Although the EU Taxonomy Regulation has been widely hailed as a groundbreaking instrument in the architecture of sustainable finance, its implementation and structural design have elicited substantial critiques. From issues of methodological rigidity and political compromise to concerns regarding administrative feasibility and legal uncertainty, the taxonomy reveals the complex tensions inherent in translating environmental policy ambitions into enforceable financial regulation.

At the heart of the EU Taxonomy lies the claim of scientific objectivity, predicated on the use of evidence-based criteria to determine the sustainability of economic activities. However, this claim has been challenged by the politicization of certain delegated acts[57], most notably the inclusion of nuclear energy and certain forms of natural gas under the classification of "transitional" activities in the Complementary Climate Delegated Act adopted in 2022. While the European Commission was obliged to justify this inclusion on the grounds of supporting the energy transition and ensuring energy security after the political compromise decision at the EU Council, multiple stakeholders — including environmental NGOs, scientific advisory bodies, and several Member States such as Austria and Luxembourg — have denounced the move as incompatible with the "do no significant harm" (DNSH) principle and lacking scientific consensus.

These developments have undermined the taxonomy's legitimacy as a neutral, science-based instrument. Critics argue that such concessions to geopolitical and industrial lobbying interests erode the credibility of the taxonomy, blurring the boundary between genuinely sustainable investments and those included for strategic or political expediency. As a result, the taxonomy risks failing in its core function[58] as a tool to combat greenwashing and may instead contribute to what some scholars have termed "regulatory greenwashing".

A further structural criticism concerns the ex-ante classification model employed by the taxonomy. The framework defines technical screening criteria and thresholds for specific economic activities, offering clarity and standardization. However, such rigidity renders the taxonomy susceptible to obsolescence in light of technological innovation and shifting environmental baselines. Green

[56] European Commission (2024). *Sustainable Finance: 2023-2024 Taxonomy Reporting Update*. Brussels.
[57] Greenpeace EU (2022). *Taxonomy vote: A political decision, not a scientific one*. Retrieved 30 June, 2025, from https://www.greenpeace.org/static/planet4-luxembourg-stateless/2024/10/3982fb8f-report_greenwashing_in_the_eu_taxonomy.pdf
[58] Zerbib, O. (2022). *EU Taxonomy and Political Capture: Risks to Green Financial Reform*. Journal of Financial Regulation and Compliance. Retrieved July1, 2025, from https://www.tandfonline.com/doi/full/10.1080/20430795.2021.2006129

technologies and business models that do not yet conform to predefined categories may be excluded, thereby stifling innovation and failing to accommodate new sustainability pathways.[59] Still, as has frequently been the case in recent years, the European Commission has incorporated provisions for planned revisions and updates into its rules and regulations.

Moreover, the process of revising technical screening criteria — requiring input from expert groups, public consultations, and approval by the European Commission — introduces regulatory inertia, inadvertently distorting capital allocation. This lag undermines policy responsiveness, particularly in fast-evolving sectors such as renewable energy, green hydrogen, and sustainable digital infrastructure. As a result, the taxonomy may inadvertently create barriers to capital allocation for emerging sustainable technologies. By privileging activities that already meet rigid sustainability thresholds, the framework risks concentrating investment in mature technologies while marginalizing emerging innovations[60] that are still under development but hold long-term environmental promise.

This "lock-in" effect may, in turn, discourage experimentation and limit the taxonomy's dynamism, particularly in high-risk, high-reward sectors such as carbon capture, storage, and bio-based materials. Moreover, because the taxonomy focuses on activity-level alignment rather than transition trajectories at the company level, it may fail to incentivize transformation in carbon-intensive industries precisely where decarbonization is most urgent. In any case, it must be underlined that the mentioned "lock-in" effect would still be less impactful and of a minor economic tonnage of a scenario in which taxonomies are not present, and where investment criteria are unaltered.

In addition, the taxonomy's complexity, granularity and the volume of associated compliance requirements have emerged as significant barriers to effective implementation. Companies must evaluate their economic activities against detailed technical screening criteria, demonstrate adherence to the DNSH principle across six environmental objectives, and verify compliance with minimum social safeguards. These tasks demand considerable technical expertise, robust internal governance structures, and access to high-quality data resources that many firms, particularly small and medium-sized enterprises, may lack. This regulatory complexity has led to concerns about market exclusion, as firms unable to bear the administrative costs of compliance may be discouraged from participating in sustainable finance markets. Inconsistent sectoral guidance and evolving delegated acts have further exacerbated uncertainty among market actors. Consequently, the taxonomy may unintentionally hinder the mobilization of capital toward sustainable economic activities, thereby undermining and diluting its foundational objective.

In summary, it may be observed that sustainable finance taxonomies hold the potential to stimulate the creation of environmentally oriented employment and to channel capital flows towards activities that support long-term ecological objectives. Nonetheless, a significant body of experts, firms, and governments appear to invoke the concept of 'transition' — notably through the continued reliance on nuclear energy and natural gas — as a means of legitimizing a more gradual decarbonization pathway. This tendency reflects broader dynamics of *path dependency* and institutional compromise,

[59] Schoenmaker, D., & Schramade, W. (2019). *Principles of Sustainable Finance*. Oxford University Press.
[60] Fatica, S., & Panzica, R. (2021). *Green Bonds and Capital Allocation under the EU Taxonomy*. ECB Working Paper Series

whereby entrenched energy infrastructures and divergent national interests shape the trajectory of regulatory design.

The taxonomy currently adopts a binary classification system, distinguishing economic activities as either taxonomy-aligned or non-aligned. While this approach provides clarity, it fails to capture the nuance and temporality of many sustainability transitions. In "hard-to-abate" sectors such as cement, steel, or aviation, progress is often incremental and context-dependent. The taxonomy's binary logic may obscure meaningful strides toward sustainability[61], penalizing firms that are actively transitioning but do not yet meet strict thresholds.

At this stage, a central question that arises spontaneously concerns whether hard-to-abate sectors should be required to intensify their decarbonization efforts or, alternatively, be supported through additional subsidies to facilitate their transition. On one hand, tightening obligations aligns with the principle of the *polluter pays*[62], ensuring that industries internalize their environmental externalities. On the other hand, proponents of targeted subsidies argue that innovation in breakthrough technologies, such as green hydrogen or carbon capture and storage, requires substantial public investment[63] to mitigate risks and attract private capital. The European Green Deal[64] reflects this tension, as it simultaneously advances stringent climate targets while also establishing mechanisms like the Innovation Fund to support decarbonization in energy-intensive sectors. Thus, the question of whether to prioritize coercive measures or financial support remains a pivotal issue in shaping a just and effective transition pathway for hard-to-abate industries.

Furthermore, the taxonomy's narrow focus on environmental sustainability, despite the ESG context, raises additional concerns. While social safeguards are required, they remain general and lack enforceable metrics. The delayed development of a parallel "social taxonomy"[65] further limits the framework's comprehensiveness, potentially encouraging environmental performance at the expense of social justice or labor rights. In this regard, scholars[66] even argued that the complexity, hard effort required, and the compliance difficulty in the creation and implementation of a purely technical taxonomical framework discouraged the modelling of social taxonomy. Conclusively, if such taxonomy is required to avoid inequity and unfairness, but the attainment of it is questioned rather than simply postponed, the EU finds itself stuck in a negative feedback loop.

As a result, despite operating under the broader ESG framework, the EU Taxonomy remains overwhelmingly focused on environmental criteria. Although it includes a clause requiring respect for minimum social safeguards (e.g., OECD Guidelines for Multinational Enterprises, UN Guiding

[61] Ameli, N., Drummond, P., Bisaro, A., Grubb, M., & Chenet, H. (2021). *Climate finance and disclosure for systemic risks: Challenges and opportunities*. Ecological Economics.
[62] OECD (2021). *Effective Carbon Rates 2021: Pricing Carbon Emissions through Taxes and Emissions Trading.* Paris: OECD Publishing.
[63] IEA (2022). *Achieving Net Zero Heavy Industry Sectors in G7 Members.* International Energy Agency.
[64] European Commission (2020). *A European Green Deal.* COM(2019).
[65] Platform on Sustainable Finance (2022). *Final Report on Social Taxonomy*. European Commission.
[66] Sara Lovisolo, LUISS Lecture at Sustainable Development & Climate Policies (Rome, 31 March 2025). *Responsible Investments 2025 views*. Amundi Investment Solutions.

Principles on Business and Human Rights), these requirements are general[67], lack operational precision, and suffer from limited enforceability.

Consequently, taxonomy-compliant investments may still be associated with adverse social or governance outcomes, including labor violations, land rights abuses, or deficient corporate oversight. This narrow environmental focus is particularly problematic in sectors such as healthcare, education, and social housing, where social sustainability constitutes the primary impact metric. Without a fully developed and integrated social taxonomy, the EU risks reinforcing a fragmented understanding of sustainability that prioritizes emissions metrics over systemic social well-being. While the initial development of an environmental taxonomy was widely regarded as a foundational step toward the eventual creation of a comprehensive social taxonomy, recent developments indicate a growing divergence between the two frameworks. Rather than progressing in tandem, environmental and social taxonomies are increasingly being treated as distinct, and at times even conflicting, policy domains — reflecting the complexity of integrating environmental and social objectives within a unified regulatory approach.

Another debate concerns Greenwashing risks and possible data gaps. Despite its explicit objective to counter greenwashing, the taxonomy's effectiveness is undermined by persistent data asymmetries and inconsistent reporting practices. While the forthcoming implementation of the Corporate Sustainability Reporting Directive (CSRD) is expected to harmonize and improve sustainability disclosures, the current transition period continues to pose significant challenges for data comparability and verification.

The taxonomy also relies heavily on self-reporting by companies, which introduces the risk of selective disclosure or methodological manipulation. Without robust enforcement mechanisms or third-party audits, investors may not be able to fully verify taxonomy-alignment claims, especially in cross-border contexts involving non-EU entities. Paradoxically, the taxonomy's strict criteria, combined with its binary logic, may create new forms of greenwashing[68] by conferring the impression of scientific precision, even where significant ambiguity persists, particularly in the case of controversial inclusions like natural gas and nuclear energy.

When considering the effectiveness of the EU Taxonomy Regulation, one has to keep in mind also the threats imposed by fragmentation across the EU member states and international incompatibility with other external taxonomies (the latter, discussed further on in more depth). The centralized nature of the EU Taxonomy imposes a uniform standard across a heterogeneous group of Member States with widely varying energy systems, economic structures, and environmental priorities. Member States with carbon-intensive economies or lagging renewable infrastructure may find the taxonomy disproportionately punitive, while others with more advanced green sectors may benefit unduly. This imbalance risks exacerbating regional disparities and undermining the EU's cohesion and just transition goals.[69]

[67] European Commission (2020). *Sustainable Finance: EU taxonomy explained,*
[68] Claeys, G., & Tagliapietra, S. (2022). *The EU taxonomy: Time to draw a line*. Bruegel Blog.
[69] Carè, (2021). *Taxonomy Regulation and the Just Transition: Regional Disparities and Political Tensions in EU Sustainable Finance*. Journal of Environmental Law.

In the global context, the taxonomy faces challenges in achieving interoperability. Various jurisdictions have developed their own taxonomies, often based on different technical criteria or policy goals. While the International Platform on Sustainable Finance (IPSF) and its "Common Ground Taxonomy" represent steps toward convergence, material differences remain, particularly regarding emissions thresholds[70] and transitional activities. For multinational investors, this fragmented landscape increases transaction costs and complicates portfolio alignment with international climate objectives.

As a regulatory tool, the EU Taxonomy primarily operates through disclosure obligations, aiming to increase transparency rather than directly mandate behavioral or investment changes. While improved transparency is a necessary precondition for market discipline, it does not in itself guarantee environmental outcomes. Critics argue that taxonomy-aligned investment flows may merely reclassify existing activities rather than catalyze additional green investments, thus limiting the taxonomy's capacity to produce net environmental benefits[71].

Furthermore, the absence of mechanisms for "brown penalization"[72], like disincentivizing harmful or unsustainable activities, means that the taxonomy lacks a comprehensive incentive structure. In its current form, it signals sustainable preferences but does not systematically discourage unsustainable investments beyond reputational considerations.

The taxonomy's legal and institutional architecture has already faced challenges that underscore its political vulnerability. The legal actions brought by Austria and other actors against the inclusion of natural gas and nuclear energy have raised questions about the regulatory consistency, democratic legitimacy, and resilience of the taxonomy framework. Such politicization exposes the process to lobbying and erodes investor confidence in the stability of taxonomy criteria.

Conclusively, misalignments between the taxonomy and other EU regulations — such as the Sustainable Finance Disclosure Regulation (SFDR) and the CSRD — have created interpretive ambiguities for market participants. These inconsistencies may generate compliance complexities, reduce regulatory clarity, and undermine the coherence of the broader EU sustainable finance policy agenda.

2.4 Alternative Policy Tools to the EU Taxonomy

Despite the persistent criticisms and ongoing scholarly debates surrounding the European Union (EU) Taxonomy, it remains a central component of the EU's regulatory framework for reorienting capital flows toward environmentally sustainable economic activities. As a classification tool, the Taxonomy Regulation offers a science-based reference for identifying sustainable investments, thereby

[70] IPSF (2022). *Common Ground Taxonomy Report*. International Platform on Sustainable Finance.
[71] OECD (2020). *Developing Sustainable Finance Definitions and Taxonomies*. OECD Publishing.
[72] In the context of sustainable finance, brown penalization denotes the regulatory practice of imposing higher capital requirements on financial institutions for exposures to carbon-intensive or environmentally detrimental assets — commonly referred to as "brown" assets. This approach stands in contrast to the application of a green supporting factor, whereby reduced capital requirements are granted for investments deemed environmentally sustainable or "green." The objective of brown penalization is to internalize environmental risks and disincentivize the allocation of capital toward activities that undermine climate and sustainability goals.

enhancing market transparency and comparability. However, as previously discussed, the Taxonomy in its current form does not represent a comprehensive policy solution. Its limitations—ranging from implementation challenges to its narrow focus on environmental criteria—necessitate a broader and more diversified policy toolkit to fully align financial markets with the EU's sustainability objectives.

In this context, a growing body of academic and policy-oriented literature argues for the adoption of supplementary and alternative instruments that can either support the functioning of the EU Taxonomy or operate independently to address areas where the Taxonomy remains insufficient. These instruments — encompassing regulatory initiatives, fiscal tools, market-based mechanisms, and voluntary standards — offer distinct operational logics and policy levers. When deployed strategically, they contribute to a more resilient and inclusive sustainable finance ecosystem by addressing market failures, enhancing incentives, and facilitating systemic transformation. Most of those proposed below already exist but deserve a strengthened and more effective use and implementation.

One of the most prominent needed instruments is *Green Public Procurement (GPP)***.** As a demand-side policy tool, GPP utilizes the substantial purchasing power of public authorities to stimulate sustainable production and consumption patterns. By incorporating environmental and, increasingly, social criteria into public tendering processes, GPP encourages private sector actors to align their goods, services, and production methods with sustainability standards. This mechanism has proven particularly effective in sectors such as construction, transport, and energy, where public procurement comprises a considerable share of total market demand. Importantly, GPP's potential extends beyond compliance incentives, as it also plays a normative role in shaping market expectations and fostering innovation through the articulation of sustainability requirements in procurement contracts.

Complementing demand-side strategies, *fiscal instruments* serve as powerful tools to influence investment behavior by altering cost-benefit calculations in favor of sustainable alternatives so to reinternalize environmental externalities and correct the market. Instruments such as tax credits, subsidies, and reduced value-added tax (VAT) rates for environmentally friendly goods and services can lower the financial barriers to entry for green investments. For example, tax deductions for energy-efficient building renovations or eco-bonuses for electric vehicle purchases effectively internalize environmental externalities by shifting market incentives toward sustainability. Although these fiscal tools are typically implemented at the national or regional level, their strategic alignment with EU-wide sustainability targets can enhance their impact and coherence[73]. Moreover, fiscal measures can play a counter-cyclical role, supporting green recovery efforts in times of economic downturn.

In addition to regulatory and fiscal approaches*, monetary and prudential policies* have emerged as critical tools in addressing climate-related financial risks and promoting sustainable financial practices. Central banks and financial supervisory authorities are increasingly integrating environmental, social, and governance considerations into their mandates, recognizing that climate-related risks pose significant threats to financial stability. In this regard, macroprudential instruments — such as climate stress testing, differentiated capital requirements based on ESG exposure, or the

[73] Coherence and Impact would certainly benefit from overcoming the rule of fiscal unanimity at European Level.

preferential treatment of green assets in asset purchase programs — offer promising avenues for aligning financial market behavior with sustainability imperatives. The work of the Network for Greening the Financial System (NGFS), which provides policy recommendations for integrating climate risks into central banking and supervision, exemplifies the growing institutional recognition of these issues. While the EU Taxonomy serves as a reference for defining green economic activities, prudential tools complement it by addressing the systemic risks associated with the transition to a low-carbon economy.

Further reinforcing the policy landscape are *market-based mechanisms*, particularly carbon pricing instruments such as carbon taxes and emissions trading systems (ETS). These tools function by assigning a monetary value to greenhouse gas emissions, thereby internalizing environmental externalities and incentivizing emitters to adopt cleaner technologies. The EU Emissions Trading System (EU ETS) stands out as a cornerstone of the EU's climate policy, operating as a cap-and-trade scheme that sets a limit on emissions while allowing market participants to trade allowances. Although distinct in design from the EU Taxonomy, carbon pricing mechanisms can operate in synergy with it. While the Taxonomy delineates what qualifies as environmentally sustainable, carbon pricing provides dynamic price signals that encourage behavioral change and reallocation of capital toward low-carbon investments. Additionally, revenues generated through carbon pricing can be reinvested in green innovation, infrastructure, and social support mechanisms, thereby enhancing both economic efficiency and distributive equity.

Beyond formal regulatory frameworks, *voluntary sustainability standards (VSS) and third-party certification schemes* also contribute meaningfully to the sustainable finance architecture. These instruments — such as the Green Bond Principles[74], the EU Climate Bonds Standard[75], and sector-specific certifications like the Forest Stewardship Council (FSC) or Fair Trade — provide non-binding yet widely recognized benchmarks for environmental and social performance. In financial markets, green bonds and sustainability-linked loans have proliferated, offering mechanisms to tie financing conditions to sustainability outcomes. While these voluntary tools lack the legal enforceability of formal regulation, they play an important role in reducing information asymmetries, enhancing transparency, and building trust among market participants. Moreover, such instruments often act as precursors to regulatory action, shaping expectations and guiding the development of future policy interventions. Nevertheless, a persistent challenge remains: since these instruments are voluntary in nature and lack strict legal enforceability, they generate discrepancies with respect to the benchmarks for environmental and social performance previously discussed. This voluntary framework fosters a degree of indifference among companies, which, when confronted with optionality, often choose to maintain established business practices rather than adopt the proposed sustainability measures. From a regulatory perspective, the more effective solution would be the introduction of binding requirements, analogous to those already in place for traditional financial and economic reporting.

[74] International Capital Market Association (ICMA). (2021). *Green Bond Principles: Voluntary process guidelines for issuing green bonds*. ICMA. https://www.icmagroup.org/sustainable-finance

[75] European Commission. (2021). *Regulation of the European Parliament and of the Council on European green bonds (EU Green Bond Standard)*,(Reg(EU)2023/2631). Brussels: European Commission. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52021PC0391

Another increasingly relevant instrument comprises *sectoral transition plans and roadmaps*, which provide forward-looking strategic guidance for achieving decarbonization across key industries. These documents typically delineate technological pathways, investment requirements, and policy measures needed to achieve climate neutrality by mid-century. Though not regulatory in nature, transition roadmaps offer valuable signaling functions, helping to align private sector strategies with public sustainability goals and enhancing long-term investment certainty. At both the national and EU levels, initiatives such as the European Commission's strategies for hydrogen, the circular economy, and sustainable mobility exemplify this planning approach. By articulating concrete milestones and timelines, these roadmaps contribute to a predictable policy environment, reduce transition risks, and facilitate sector-specific benchmarking.

In sum, while the EU Taxonomy serves as a foundational tool in the EU's sustainable finance agenda, it does not function in isolation. A variety of complementary and alternative policy instruments play integral roles in reinforcing and extending the impact of the Taxonomy. Each of these tools brings distinct strengths and confronts unique limitations, reinforcing the need for a coherent, multi-instrument policy architecture that can accommodate diverse economic, social, and environmental realities. Understanding the interactions among these instruments is essential for improving the effectiveness, inclusiveness, and resilience of sustainable finance policies within the EU and beyond.

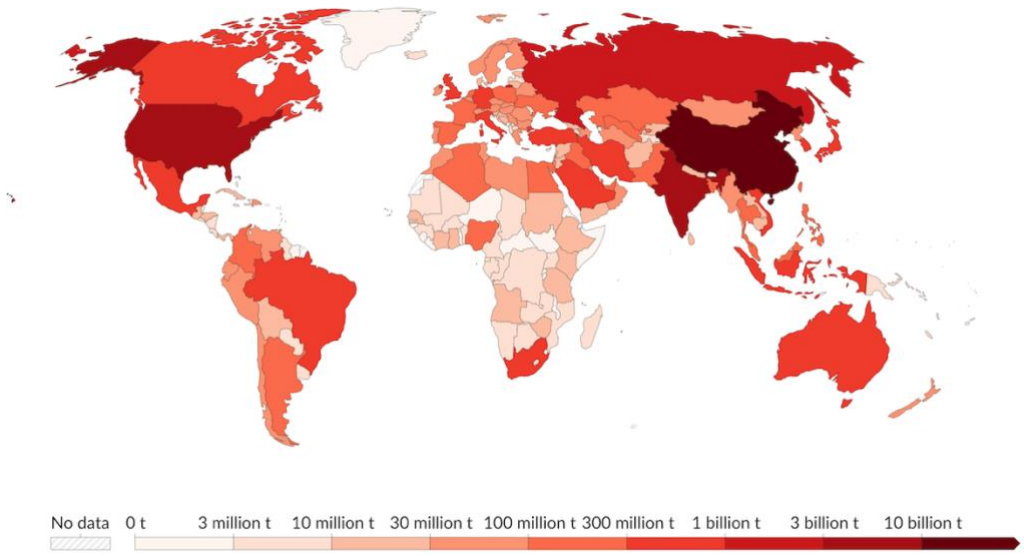
CHAPTER 3: *Sustainable Finance Taxonomies from a Global Perspective*

As acknowledged in the first chapter, in the quiet hum of industrial progress and the relentless tide of consumption, the atmosphere has become a mirror, reflecting not only the carbon we burn but also the values we enshrine. Greenhouse gas emissions, once an invisible byproduct of growth, now loom as planetary warnings, inscribed in the rising seas, in drought-stricken soil, and in the staggering loss of biodiversity. From the Arctic's vanishing ice to the equator's intensified storms, the climate system has begun to respond with increasing urgency to anthropogenic disruption.

Amid this turbulence, the limits of conventional policy frameworks become increasingly apparent. Markets, left unmoored, have proven ill-equipped to internalize ecological boundaries. Capital continues to flow heedlessly toward emissions-intensive sectors, guided by outdated valuations and misaligned incentives. In response, sustainable taxonomies are emerging as instruments of classification, legislating the possible, recalibrating risk, and drawing the lines between climate-compatible futures and stranded pasts.

Yet taxonomies are not ideologically or politically neutral. They are shaped by the histories, economies, and ambitions of the States that design them. It is for this reason that a comparative analysis becomes not only valuable, but essential. This study turns its gaze to three nations whose trajectories matter profoundly in the struggle against climate collapse: China, the United States of America, and Indonesia. These countries represent not just large emitters or strategic economies, but distinct approaches to climate governance, financial regulation, and developmental priority (refer to **Figure 9**).

[Figure 9]: 2023 Annual emissions of CO_2 from fossil fuels and industry. Land-use change not included.



Source: Ritchie, H. (2019). *Who emits the most CO2 today?* Our World in Data. https://ourworldindata.org/annual-co2-emissions

China, the world's largest emitter as a country and a central actor in global green technology supply chains, has developed a taxonomy that seeks to harmonize environmental policy with state-directed capital. It is technocratic, ambitious, and increasingly aligned with international standards, yet it reflects a governance model rooted in centralized authority and industrial policy. The **United States of America**, the second larger emitter as a country and the first in per capita terms, has reluctantly approached sustainable finance with caution and pluralism. Its emerging taxonomies — fragmented, market-driven, and heavily contested — mirror the country's broader regulatory architecture: decentralized, polarized, yet immensely influential in global finance. **Indonesia**, a rising power in the Global South and a custodian of critical ecosystems, offers a case of taxonomy development shaped by both vulnerability and opportunity. As an archipelago on the front lines of climate change, Indonesia's taxonomy reflects its struggle to balance economic growth, environmental integrity, and social inclusion.

By exploring the taxonomies of these three countries, this chapter investigates how States conceptualize sustainability under conditions of ecological emergency and geopolitical divergence. It examines how the imperative to reduce emissions is translated into financial classifications, how taxonomies serve as tools of both compliance and vision, and how local context shapes global ambition.

3.1 Sustainable Finance taxonomies in China

In recent years, China has emerged as a pivotal, yet dichotomic, actor in the global sustainability transition, both as the world's largest emitter of greenhouse gases and as a leading investor in green finance. China's trajectory as a major contributor to global greenhouse gas emissions is closely intertwined with its rapid industrialization and economic transformation since the late 20th century. Following the economic reforms initiated in the late 1970s under the "Reform and Opening-Up"[76] policy, China experienced unprecedented economic growth, largely driven by energy-intensive industries, export-oriented manufacturing, and a heavy reliance on coal as a primary energy source.

As a result, China's carbon dioxide emissions began to rise sharply in the 1990s and surpassed those of the United States by the mid-2000s, making it the world's largest annual emitter of GHGs by volume. This growth, however, must be contextualized: on a per capita basis, China's emissions have historically remained lower than those of many industrialized countries, and a significant portion of its emissions is linked to the production of goods consumed abroad.

Moreover, the Chinese government has increasingly recognized the environmental and geopolitical consequences of its carbon footprint, adopting a range of domestic policies and international commitments, most notably the pledge to achieve carbon neutrality by 2060 and peak emissions before 2030 (from here, the oxymoronic position of this country). Thus, while China's historical contribution to cumulative emissions is less than that of many developed economies, its current

[76] This set of policies, also known as the Chinese Economic Miracle, were implemented after Mao Zedong's death, occurred in 1976. The fundamental aim was to bring forward a variety of economic reforms with a strong Chinese socialist character and socialist market elements in the People's Republic of China.

emissions profile and strategic position in global supply chains render it a critical actor in international climate governance.

Recognizing the environmental and financial risks posed by climate change and ecological degradation, the Chinese government has advanced an ambitious agenda to mainstream sustainability considerations within its financial system[77]. A central element of this agenda is the development and refinement of a sustainable finance taxonomy, commonly referred to in China as the *Green Bond Endorsed Project Catalogue* [78], which provides a classification system for environmentally beneficial economic activities.

China's sustainable finance taxonomy has evolved over the past decade from a fragmented, institution-specific framework into a more consolidated and standardized tool. The first major step came in 2015, when the People's Bank of China released its Green Bond Endorsed Project Catalogue[79], which became the authoritative guide for determining the eligibility of green bond proceeds in the interbank bond market. This Catalogue was later adopted and adapted by other regulatory agencies, including the National Development and Reform Commission (NDRC) and the China Securities Regulatory Commission (CSRC), each of which developed their own taxonomies for different segments of the bond market.

However, the coexistence of multiple taxonomies led to inconsistencies in green definitions and reporting requirements, which impeded market efficiency and credibility. To address these issues, in 2021, the PBoC, NDRC, and CSRC jointly issued a unified Green Bond Endorsed Project Catalogue (2021 Edition). This marked a crucial step toward harmonization and was aligned with China's broader policy goal of achieving carbon neutrality by 2060 and peak emissions by 2030, as announced by President Xi Jinping in 2020. Notably, the 2021 revision eliminated the eligibility of clean coal and fossil fuel-related technologies from the list of green activities — a significant policy shift[80] that brought China's taxonomy closer to international standards and improved its environmental integrity.

China's green taxonomy is primarily designed to guide capital allocation toward environmentally beneficial projects. The Green Bond Catalogue organizes projects into six major categories, which correspond closely to the country's environmental policy priorities:

1. Energy saving
2. Pollution prevention and control
3. Resource conservation and recycling
4. Clean energy
5. Ecological protection and climate change adaptation

[77] A key role in leading the China to a more sustainable position can be attributed to the G20 Study Group on Green Finance (recently transformed in Sustainable Finance), co-chaired by the chief economist of the People's Bank of China, Ma Jun, with Mark Carney, then the Governor of the Bank of England.

[78] People's Bank of China (PBoC) (2021), 绿色债券支持项目目录, *Green Bond Endorsed Project Catalogue* (*2021 Edition)*. http://www.pbc.gov.cn/goutongjiaoliu/113456/113469/4342400/20210916171800898 79.pdf

[79] People's Bank of China (PBoC). (2015). *Green Bond Endorsed Project Catalogue (2015 Edition)*. http://www.greenfinance.org.cn/displaynews.php?id=468

[80] OECD. (2022). *Sustainable Finance in Emerging Markets: China Case Study*. OECD Publishing.

6. Green upgrading of infrastructure and clean transportation

Each category is further broken down into subcategories and specific project types, with detailed technical criteria to determine eligibility. The taxonomy serves both regulatory and market functions: it informs financial institutions and corporate issuers about eligible uses of green bond proceeds, and it enables regulators to monitor the environmental performance and consistency of green finance instruments. Such taxonomy is additionally, closely integrated with:

- *Green bond standards*, which require that at least 50% of proceeds be allocated to projects listed in the Green Bond Catalogue[81].
- *Green credit guidelines*, under which commercial banks are encouraged to extend credit preferentially to projects aligned with the taxonomy.
- *Disclosure obligations*, particularly under the new environmental information disclosure system piloted by the PBoC for financial institutions.
- *Green finance pilot zones*, where taxonomies are used to assess and support regional sustainability initiatives.

By serving as a reference point for regulatory policies, financial product development, and environmental performance assessment, the taxonomy facilitates a systemic approach to aligning the financial sector with China's national sustainability goals.

From a broader global perspective, a significant development in recent years has been China's involvement in international taxonomy harmonization efforts, especially through the International Platform on Sustainable Finance (IPSF). In November 2021, the European Commission and the PBoC released the Common Ground Taxonomy (CGT) — a comparative framework that identifies commonalities between the Chinese and EU taxonomies in terms of environmental objectives and eligible activities.[82] The CGT covers climate change mitigation and includes technical screening criteria for several sectors, such as energy, manufacturing, and transportation.

This initiative has been instrumental in increasing the international credibility and comparability of China's taxonomy. It also lays the groundwork for cross-border sustainable finance, enabling Chinese and European investors to better assess the greenness of financial instruments across jurisdictions. Despite some differences — most notably in the scope of social safeguards, DNSH criteria, and technological thresholds — the CGT demonstrates substantial convergence in key sectors, underscoring the growing potential for global interoperability in green finance classification systems.

Despite notable progress, China's sustainable finance taxonomy continues to face a series of significant challenges that constrain its overall effectiveness and credibility within both domestic and international financial frameworks. A primary concern lies in its limited scope, particularly with regard to the exclusion of social and governance dimensions. While the taxonomy demonstrates a strong emphasis on environmental outcomes, it does not incorporate social and governance criteria in a systematic manner. This narrow focus creates a misalignment with broader Environmental,

[81] CSRC. (2021). *Guidelines for the Evaluation and Certification of Green Bonds*.
[82] International Platform on Sustainable Finance (IPSF). (2021). *Common Ground Taxonomy – Climate Change Mitigation Activities*.

Social, and Governance (ESG) frameworks commonly adopted in global markets, thereby limiting the taxonomy's interoperability and diminishing its utility[83] for international investors seeking a comprehensive sustainability benchmark.

Another pressing issue relates to the taxonomy's level of granularity. Although the current framework outlines categories and subcategories for eligible green activities, it often falls short in providing sufficiently detailed or scientifically rigorous criteria for certain project types. This lack of precision increases the risk of greenwashing, as the ambiguity may allow for the inclusion of projects that do not meet high environmental standards. Consequently, inconsistent implementation becomes more likely across different sectors and institutions, undermining the taxonomy's role as a reliable classification tool for sustainable finance.

The regulatory structure surrounding the application of the taxonomy also presents notable inconsistencies. While it is mandatory for green bond issuance in China's interbank and exchange-traded bond markets, its use remains largely voluntary in other segments of the financial system, such as private lending, asset management, and certain insurance-related activities. This uneven application dilutes the taxonomy's effectiveness as a unifying standard and reduces its capacity to steer capital consistently toward environmentally sustainable investments across the broader financial sector.

Moreover, the taxonomy does not yet impose stringent requirements for third-party verification or comprehensive impact reporting, although such practices are gradually gaining traction within the market. The absence of binding obligations for external assurance and transparent disclosure weakens the credibility of labelled green products, as it leaves room for discrepancies between stated and actual environmental impacts. As noted by the United Nations Environment Programme Finance Initiative[84], this regulatory gap can erode investor confidence and limit the capacity of China's taxonomy to uphold environmental integrity in financial instruments purportedly aligned with sustainable objectives. Collectively, these challenges underscore the need for further refinement and institutional support to enhance the taxonomy's robustness, legitimacy, and alignment with global best practices in sustainable finance.

In addition, to enhance the credibility and overall effectiveness of China's sustainable finance taxonomy, a number of strategic policy recommendations can be considered. First and foremost, there is a pressing need to incorporate the principle of "Do No Significant Harm" (DNSH), along with minimum social safeguards, into the existing framework. These elements are central to ensuring that economic activities classified as sustainable do not inadvertently cause adverse social or environmental impacts elsewhere, and their inclusion would align the Chinese taxonomy more closely with internationally recognized standards such as those embedded in the EU Taxonomy.

Equally important is the expansion of mandatory disclosure requirements for financial actors and project developers. In particular, post-issuance reporting and the integration of third-party verification mechanisms would significantly enhance the transparency, reliability, and comparability of data

[83] Zhou, X., Wang, Y., & Wu, Y. (2022). *China's Sustainable Finance Taxonomy: Progress, Challenges, and International Implications.* Journal of Sustainable Finance & Investment. Chapter 12(1), pages 45-62.
[84] UNEP FI. (2021). *China Green Finance Progress Report 2021.*

related to taxonomy-aligned investments. Such mechanisms are vital for building investor confidence and for minimizing the risk of greenwashing — an issue that continues to threaten the integrity of sustainable finance markets globally.

Improving the scientific rigor and credibility of the taxonomy's technical screening criteria also represents a key area for advancement. This could be achieved by involving independent expert institutions in the formulation and periodic revision of these criteria, thereby ensuring that they remain grounded in the most current scientific evidence and reflect evolving best practices in environmental assessment. By anchoring the taxonomy in a more robust methodological foundation, policymakers can create a classification system that is both credible and adaptable over time.

Capacity-building efforts will also be crucial to the success of the taxonomy, particularly among financial institutions and local governments. These stakeholders play a pivotal role in implementing sustainable finance policies on the ground yet often face resource and knowledge constraints that hinder consistent application. Targeted training programs, technical assistance, and institutional support mechanisms should therefore be prioritized to facilitate widespread and effective uptake of the taxonomy's provisions.

Furthermore, strengthening international cooperation stands as a critical objective. In particular, fostering closer alignment and interoperability with other major taxonomies — such as that of the European Union and frameworks developed by the International Platform on Sustainable Finance (IPSF) — would enable mutual recognition and facilitate the flow of green capital across borders. Such alignment not only supports the harmonization of global sustainability standards but also positions China as a proactive participant in the emerging global sustainable finance architecture.

Within the broader context of national development, these recommendations are especially pertinent given the strategic emphasis placed on green growth in China's 14th Five-Year Plan (2021–2025). This plan underscores ecological transition as a national priority, and sustainable finance — particularly through the implementation of an effective and internationally credible green taxonomy — will play an indispensable role in realizing this vision. As China continues to refine and expand its taxonomy, grounding it in scientific integrity, improving institutional capacity, and embracing international cooperation, the country is well-positioned to not only transform its domestic financial system but also contribute meaningfully to the evolution of global sustainable finance norms and practices.

In conclusion, as China positions itself at the forefront of the green transition, the taxonomy plays a strategic role not only in achieving domestic ecological goals but also in shaping global sustainable finance architecture. Its alignment with international frameworks, particularly through platforms such as the IPSF and bilateral cooperation with the European Union, signifies a growing openness to interoperability and cross-border capital mobilization. In this context, China's taxonomy is more than a technical classification tool; it is a vehicle for regulatory innovation, institutional learning, and multilateral dialogue.

Ultimately, the development of China's sustainable finance taxonomy marks a pivotal contribution to the broader endeavor of aligning financial systems with the imperatives of climate resilience and

environmental sustainability. As it continues to mature, the taxonomy offers both practical insights and normative benchmarks for other jurisdictions navigating the complexities of sustainable finance. In an era where financial policy must respond decisively to planetary boundaries, China's taxonomy stands as a significant milestone in the transition toward a more transparent, science-based, and globally harmonized green financial system.

3.2 Sustainable Finance taxonomies in the United States of America

The United States has played a pivotal role in the historical accumulation of greenhouse gas emissions, owing to its early industrialization and prolonged reliance on fossil fuels across the energy, transportation, and manufacturing sectors. As the birthplace of the Industrial Revolution's second wave and a global leader in economic and technological development throughout the 20th century, the U.S. has accrued the largest share of historical CO_2 emissions globally, accounting for approximately 25% of cumulative emissions[85] since 1750. The American economic model, characterized by high levels of energy consumption per capita, suburban sprawl, automobile dependence, and an expansive industrial base, contributed significantly to global atmospheric carbon concentrations. While the U.S. has made progress in decoupling economic growth from emissions in recent decades — through fuel efficiency standards, technological innovation, and shifts from coal to natural gas and renewables — the country remains among the top annual emitters. Furthermore, its historical leadership in emissions has been paralleled by a complex and often ambivalent approach to international climate policy, exemplified by its withdrawal from and subsequent re-entry into the Paris Agreement. This ambivalence reflects not only political volatility but also the entrenched power of fossil fuel interests and the decentralization of climate governance across federal and state jurisdictions.

This complex policy environment also helps explain the absence of a federally endorsed sustainable finance taxonomy in the United States. Unlike the European Union, where supranational institutions and political consensus have facilitated the creation of a legally binding green taxonomy, the U.S. has opted for a fragmented and market-driven approach to sustainable finance. Several factors contribute to this divergence. First, the U.S. regulatory framework is characterized by institutional pluralism and regulatory fragmentation, with multiple agencies—such as the Securities and Exchange Commission (SEC), the Environmental Protection Agency (EPA), and the Commodity Futures Trading Commission (CFTC)—holding overlapping but often inconsistent mandates. This has limited the capacity for coordinated, top-down regulatory initiatives.[86]

Second, the highly politicized nature of climate policy in the U.S.— often framed within partisan ideological divides — has impeded legislative consensus on green finance, with efforts to introduce

[85] Ritchie, H., & Roser, M. (2020). *CO_2 and Greenhouse Gas Emissions*. Our World in Data. https://ourworldindata.org/co2-and-other-greenhouse-gas-emissions

[86] Flammer, C., Hong, B., & Minor, D. (2021). Corporate Governance and the Rise of Integrating ESG into Risk Management, pages 85–93. *Harvard Business Review*.

sustainability standards frequently met with resistance from conservative policymakers and industry lobbyists.

Third, the American regulatory tradition places a strong emphasis on principles-based disclosures rather than prescriptive classifications, as seen in the SEC's climate-related disclosure rule[87], which focuses on materiality and transparency rather than defining what qualifies as a sustainable economic activity. Consequently, the development of sustainable finance in the U.S. has largely been shaped by private sector initiatives, voluntary standards, and investor-driven ESG frameworks, rather than a unified public taxonomy. While there is growing recognition of the need for regulatory clarity, particularly to combat greenwashing and ensure capital alignment with climate goals, the political and institutional context continues to constrain the establishment of a comprehensive taxonomy akin to that of the EU.

In the absence of a binding federal taxonomy, several market-driven initiatives have emerged to fill the gap. These frameworks, though influential, differ in scope, methodology, and legal authority. One of the most notable examples is the work of the Sustainability Accounting Standards Board (SASB), which, prior to its consolidation into the International Sustainability Standards Board (ISSB) in 2021, played a leading role in defining sector-specific environmental, social, and governance disclosure standards. While not a taxonomy in the strict sense, SASB's *materiality*[88]-based framework[89] provided structured guidance for companies to disclose financially relevant sustainability information. This focus on financial materiality, rather than normative sustainability thresholds, reflects a distinctive characteristic of the U.S. approach — prioritizing investor relevance over prescriptive classification of economic activities.

This principle-based orientation is also evident in the functioning of the U.S. green bond market, which operates predominantly on voluntary guidelines rather than regulatory mandates. U.S. issuers typically adhere to the Green Bond Principles (GBP) established by the International Capital Market Association (ICMA), relying on external reviewers—such as Sustainalytics or Cicero Shades of Green[90]—to assess the environmental integrity of financed projects. While these external assessments provide a measure of transparency and credibility, the lack of a uniform taxonomy limits comparability, raising questions about the consistency of green labelling practices across issuers and sectors. In this context, the absence of a binding definitional framework hinders the broader goal of aligning private capital with environmental objectives in a robust and standardized manner.

To address this definitional gap, some U.S.-based financial actors have turned to international classification systems, most notably the Climate Bonds Taxonomy developed by the Climate Bonds Initiative (CBI)[91]. This taxonomy, grounded in science-based screening criteria aligned with a 1.5°C

[87] U.S. Securities and Exchange Commission (SEC). (2022). *Proposed Rule: The Enhancement and Standardization of Climate-Related Disclosures for Investors*. https://www.sec.gov/rules/proposed/2022/33-11042.pdf
[88] For *materiality* we refer to a importance of sustainability issues to a company's financial performance and impact on ESG aspects.
[89] SASB (2021). *SASB Standards Application Guidance*. Value Reporting Foundation.
[90] A Subsidiary of CICERO climate research center, which provides second party opinions on green financing using a color-coded methodology highlighting climate alignment.
[91] CBI is an international non-profit organization, founded in 2009, that focuses on mobilising global capital for climate action. Its primary mission is to develop and promote investment in projects and assets that support a rapid transition to a low-carbon and climate-resilient economy.

emissions trajectory, is used for certifying climate-related bonds worldwide. While it offers a more rigorous framework than many domestic alternatives, it remains voluntary and lacks formal regulatory endorsement within the U.S. As such, its influence is limited to issuers and investors who voluntarily opt into its framework, and it does not resolve the broader issue of systemic fragmentation in the American sustainable finance landscape.

However, during his presidency, Donald J. Trump adopted a markedly skeptical stance toward multilateral and domestic climate initiatives, positioning his administration in sharp contrast to prevailing global efforts to address climate change. Most notably, in 2017 he announced the withdrawal of the United States of America from the Paris Agreement, arguing that its commitments imposed disproportionate economic costs on American industries and workers. Domestically, his administration sought to dismantle or weaken several climate-related regulations, including the Clean Power Plan, fuel efficiency standards, and restrictions on methane emissions. Simultaneously, subsidies and regulatory support for fossil fuel industries were maintained or expanded, reflecting a prioritization of short-term economic growth and energy independence over long-term decarbonization objectives. Equally significant is what his administration chose not to do: it refrained from advancing comprehensive federal climate legislation, did not strengthen environmental protection frameworks, and avoided investment in renewable energy at a scale comparable to other advanced economies. Collectively, these decisions underscored a deliberate retrenchment from climate action, *which not only slowed domestic progress on decarbonization but also weakened U.S. credibility in international climate governance.*[92]

Nonetheless, recent policy developments under the Biden Administration have indicated a growing federal interest in mainstreaming climate considerations into financial governance. Executive Order 14030 on Climate-Related Financial Risk, issued in May 2021, directed federal agencies to identify, assess, and mitigate climate-related financial risks. This led to the establishment of the Climate-related Financial Risk Advisory Committee (CFRAC) under the Financial Stability Oversight Council (FSOC), *signaling a coordinated interagency effort to enhance climate risk oversight*[93]. These actions, while not directly instituting a taxonomy, lay the groundwork for more systematic integration of climate considerations into financial regulation.

The Securities and Exchange Commission (SEC) has emerged as a central actor in this evolving regulatory landscape. In 2022, the SEC proposed a landmark rule[94] mandating climate-related disclosures for publicly listed companies, including Scope 1 and Scope 2 greenhouse gas emissions[95] and material climate-related financial risks. Though the rule stops short of defining which activities are considered sustainable, it represents a significant institutional step toward formalizing ESG

[92] Colgan, J. D., Green, J. F., & Hale, T. (2021). *Asset Revaluation and the Existential Politics of Climate Change*. International Organization.
[93] White House (2021). *Executive Order on Climate-Related Financial Risk*. The White House, May 20, 2021.
[94] SEC (2022). *The Enhancement and Standardization of Climate-Related Disclosures for Investors*. U.S. Securities and Exchange Commission.
[95] For clarity, I report in this footnote the respective definitions of Scope 1 and 2, translated and re-elaborated from website https://zeroco2.eco/it/glossario/scope-1-2-3/ :

- **Scope 1** refers to the direct GHG emissions that come from sources owned or controlled by the entity reporting its emissions.
- **Scope 2** refers to the indirect GHG emissions associated to electricity production, heat or steam acquired from the entity reporting its emissions.

reporting. In parallel, the SEC has intensified its scrutiny of greenwashing practices[96] in ESG funds, emphasizing the need for greater transparency and accountability in sustainable investment claims. These regulatory measures indicate a growing institutional awareness of the need to improve market integrity, even in the absence of a unified taxonomy.

Beyond domestic regulation, the U.S. Department of the Treasury has engaged in multilateral initiatives aimed at fostering convergence in sustainable finance standards. Through its participation in the G20 Sustainable Finance Working Group and the International Platform on Sustainable Finance (IPSF), the Treasury has supported dialogue on aligning sustainability definitions and disclosure frameworks. However, despite this international engagement, the United States has neither adopted a domestic taxonomy nor signaled formal alignment with the EU Taxonomy or other global benchmarks. This continued reluctance reflects deeper structural and political dynamics that constrain the development of a binding taxonomy at the federal level.

The consequences of this policy vacuum are manifold. The coexistence of multiple voluntary standards has led to inconsistency and complexity, complicating the task of comparing sustainable financial products across issuers and markets. In the absence of legally defined sustainability criteria, the risk of greenwashing is heightened, with financial actors potentially making exaggerated or misleading sustainability claims. Additionally, U.S. financial institutions operating internationally face challenges in aligning with more prescriptive frameworks such as those in the European Union or China, creating friction in cross-border investment and regulatory compliance. Finally, regulatory uncertainty may deter long-term investment in sustainable infrastructure, undermining the mobilization of private capital necessary for achieving national and global climate targets.

Amid these challenges, there is a growing recognition — among academics, market participants, and policymakers — of the potential benefits that a national taxonomy could offer. A well-designed taxonomy could enhance market transparency, reduce reputational risks, and guide investment flows toward climate-aligned activities. It could also support the harmonization of standards across jurisdictions, facilitate financial innovation, and improve the comparability of ESG data. Yet the path toward developing such a taxonomy is fraught with political and institutional obstacles, including inter-agency coordination challenges, lobbying pressures from carbon-intensive industries, and ideological divisions over the role of government in regulating financial markets.

A potential compromise could involve the development of a principles-based, modular taxonomy under the leadership of FSOC, the Treasury, or the SEC. Such a framework could incorporate science-based thresholds — similar to those developed by the IPSF's Common Ground Taxonomy (CGT) — while allowing for sectoral and regional flexibility. This hybrid approach would aim to balance regulatory prescriptiveness with the adaptability preferred by U.S. market actors, potentially making a federal taxonomy more politically viable and operationally effective.

In conclusion, sustainable finance taxonomies serve as critical infrastructure for ensuring the integrity, scalability, and credibility of ESG-oriented financial markets. While the United States has not yet adopted a federal taxonomy, a complex web of private and institutional frameworks has emerged to approximate its functions. However, the continued absence of a unified and legally

[96] SEC (2023). *SEC Charges Investment Adviser for Misleading ESG Disclosures*. Press Release.

binding classification system limits regulatory coherence, increases the risk of greenwashing, and impedes international alignment. As global sustainable finance efforts continue to evolve, the future of U.S. policy in this domain will likely depend on a confluence of regulatory initiative, political consensus, and market demand. Ultimately, greater harmonization of taxonomies across jurisdictions will be essential to enabling cross-border capital flows and accelerating the transition to a low-carbon economy.

3.3 Sustainable Finance taxonomies in Indonesia

As the global momentum toward sustainable finance accelerates, developing economies are increasingly recognizing the importance of aligning financial systems with sustainability goals. Among these emerging leaders is Indonesia, which has taken pioneering steps in Southeast Asia by developing and operationalizing a national sustainable finance taxonomy. While Indonesia's industrial emissions remain lower in per capita terms than those of many developed countries, it consistently ranks among the world's top ten country emitters[97] due to its high rates of deforestation, peatland degradation, and forest fires. The country's emissions profile is uniquely shaped by its land-use sector: more than half of its GHG emissions stem from land-use, land-use change, and forestry (LULUCF), making Indonesia one of the few major economies where *land-based emissions surpass those from energy and transportation*.[98] Since the 1990s, large-scale palm oil expansion, illegal logging, and peatland conversion have dramatically accelerated forest loss, triggering carbon release on a massive scale. Despite committing to reduce emissions under its Nationally Determined Contribution (NDC) to the Paris Agreement, Indonesia continues to face challenges in reconciling economic growth with environmental protection.

The environmental risks confronting Indonesia are acute and multifaceted, placing it among the nations most vulnerable to the impacts of climate change. As an archipelagic state with over 17,000 islands and a coastline stretching more than 54,000 kilometers, Indonesia is highly susceptible to sea-level rise, coastal erosion, and saltwater intrusion, which threaten critical infrastructure[99], agricultural productivity, and human settlements. At the same time, shifting rainfall patterns, prolonged droughts, and intensified forest fires — many of which are human-induced — pose substantial risks to biodiversity, public health, and food security. The country is also home to some of the world's most biodiverse ecosystems, including rainforests in Sumatra, Borneo, and Papua, which are increasingly degraded by unsustainable land use practices. These environmental stressors are further exacerbated by weak enforcement of environmental regulations and limited coordination between national and sub-national authorities. Without decisive intervention, Indonesia's ecological degradation could undermine both its development goals and long-term climate resilience.[100]

Given these intersecting challenges, the development of a sustainable finance taxonomy in Indonesia is both urgent and strategically necessary. By clearly defining what constitutes environmentally sustainable economic activities, such a framework would enhance market transparency, reduce

[97] Global Carbon Atlas. (2022). *CO_2 Emissions*. http://www.globalcarbonatlas.org
[98] Ministry of Environment and Forestry (MoEF). (2021). *Indonesia's Third Biennial Update Report (BUR) to the UNFCCC*.
[99] World Bank. (2021). *Indonesia Country Climate and Development Report*. https://www.worldbank.org
[100] See the OECD (2019), *OECD Green Growth Policy Review of Indonesia 2019*, OECD Environmental Performance Reviews, OECD Publishing, Paris, https://doi.org/10.1787/1eee39bc-en.

greenwashing risks, and improve investor confidence — particularly in key sectors such as energy, agriculture, forestry, and infrastructure. Moreover, a taxonomy tailored to Indonesia's national context would support the implementation of its NDCs and long-term low-emissions development strategy, while also attracting green investment in areas vulnerable to climate risk. Recognizing this, the Indonesian Financial Services Authority (OJK)[101] published a Green Taxonomy 1.0 in 2022 as an initial step toward building a classification system for sustainable activities.

However, the development of a sustainable finance taxonomy in Indonesia was first initiated under OJK Regulation No. 51/POJK.03/2017[102], which mandates financial institutions, issuers, and public companies to implement sustainable finance practices. This regulation outlined a roadmap for sustainable finance and identified the need for a classification system to guide investment and lending decisions.

Only after several years of stakeholder consultations and technical assistance from multilateral organizations, OJK formally launched the Indonesia Green Taxonomy (IGT) 1.0 in January 2022. This taxonomy represents a foundational step toward a more comprehensive classification system encompassing environmental, social, and governance (ESG) dimensions. The initial version of the IGT aims to: (i) Provide guidance to financial institutions in identifying and supporting green economic activities; (ii) Serve as a reference for green bonds and green financing instruments; (iii) Align with national and international environmental commitments, including Indonesia's Nationally Determined Contributions (NDCs) under the Paris Agreement.

The IGT 1.0 presently encompasses 919 types of business activities across a broad range of sectors, including energy, forestry, waste management, and transportation.[103] This extensive coverage demonstrates the government's ambition to embed sustainability criteria across the entire economic spectrum. A distinctive feature of the IGT is its adoption of a so-called "traffic light" classification system, which stratifies activities into three categories based on their environmental performance:

- *Green:* Activities that contribute substantially to environmental objectives and do no significant harm.
- *Yellow:* Transition activities that do not yet fully meet green criteria but show potential for improvement.
- *Red:* Activities that are environmentally harmful or incompatible with sustainability goals.

This phased and flexible categorization reflects a pragmatic recognition of Indonesia's developmental context and avoids the premature exclusion of high-emission sectors, instead encouraging their gradual transformation toward greater sustainability.

[101] Indonesia has embedded sustainability into its financial regulatory system since the mid-2010s. The Financial Services Authority (Otoritas Jasa Keuangan, OJK) has emerged as the principal driver of sustainable finance policy in the country.
[102] The information acquired from this regulation were retrieved from the unofficial translation copy of the regulation of the financial services authority number 51/POJK.03/2017 available at the link https://forestsandfinance.org/wp-content/uploads/2017/09/POJK-51-Unoffical-English-Translation-2017.pdf
[103] OJK (2022). *Indonesia Green Taxonomy 1.0*. Otoritas Jasa Keuangan. Retrieved from: www.ojk.go.id

Building on this adaptive approach, Indonesia's taxonomy framework has been designed with deliberate reference to international standards, thereby facilitating both domestic implementation and global integration. Although the IGT is inherently tailored to national priorities and economic structures, its development has been informed by globally recognized frameworks such as the EU Taxonomy for Sustainable Activities, the ASEAN Taxonomy for Sustainable Finance — of which Indonesia is a contributing member — the Green Bond Principles issued by the International Capital Market Association, and the Common Ground Taxonomy (CGT) established by the International Platform on Sustainable Finance. These cross-jurisdictional influences enhance the credibility of the IGT in international markets and help ensure that Indonesia's sustainable financial instruments are consistent with emerging global norms. Furthermore, alignment with these standards supports cross-border capital flows and promotes investor confidence in Indonesian green financial products.

The practical application of the IGT is most evident in its integration with sustainable finance instruments, particularly green bonds and sukuk[104]. The Indonesia Green Bond and Green Sukuk Framework, launched in 2018 by the Ministry of Finance, has become a vital mechanism for mobilizing funds for environmentally beneficial projects. The IGT now serves as a key reference point for identifying eligible expenditures within this framework, thereby institutionalizing its relevance within the country's green finance infrastructure. By 2023, Indonesia had issued more than USD 3.5 billion in green sukuk[105], positioning itself as a global frontrunner in Islamic green finance. The incorporation of the taxonomy into these instruments enhances transparency and accountability by providing a standardized methodology for evaluating the environmental sustainability of financed activities, thereby reducing reputational risks and bolstering investor trust.

Despite these advancements, the implementation of the IGT faces several substantial challenges that may hinder its effectiveness. One critical issue pertains to data availability and verification. The robust application of taxonomy criteria requires detailed, consistent, and reliable environmental data at the project and company level. However, many Indonesian firms, particularly small and medium-sized enterprises (SMEs), lack the capacity or incentives to collect and disclose such data, resulting in compliance difficulties and impeding the role of external verifiers. Without standardized data collection frameworks and adequate incentives for disclosure, the credibility and comparability of sustainability assessments remain limited.

Closely related to the data challenge is the issue of capacity constraints within the Indonesia's financial sector. While large financial institutions may have the resources to integrate taxonomy principles into their credit evaluation and investment processes, smaller banks and non-bank financial entities often lack the technical expertise and institutional readiness to do so effectively. This implementation gap underscores the need for comprehensive capacity-building initiatives, including training programs and technical assistance, to ensure that taxonomy-aligned practices are adopted across the entire financial ecosystem and not limited to a few leading institutions.

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[104] "*Green Sukuk is a sharia-compliant bond, where 100% of the proceeds go exclusively to finance or re-finance green projects that contribute to mitigation and adaptation of climate change as well as preservation of biodiversity*." From Ministry of Finance Republic of Indonesia, Sustainable Developing Financing (2019). *Indonesia's Green Sukuk Initaitive.* UNDP retrieved from https://files.acquia.undp.org/public/migration/id/INS-UNDP-Indonesia-Sustainable-Development-Financing.pdf

[105] Climate Bonds Initiative (2023). *Green Bond Market Summary Q1 2023*.

Moreover, the broader policy environment presents obstacles to the full operationalization of the taxonomy. Indonesia's economic structure is heavily reliant on sectors with high environmental impacts, such as coal mining and palm oil production. Although the taxonomy's inclusion of "transition" activities is designed to accommodate the gradual decarbonization of these sectors, entrenched economic interests and regulatory fragmentation across ministries may undermine effective implementation. In the absence of coherent sectoral policies and strong inter-agency coordination, there is a risk that sustainability objectives will be subordinated to short-term economic considerations.

Another emerging risk concerns the potential for greenwashing and mislabeling, particularly given the taxonomy's flexible and aspirational classification structure. While the traffic light system offers a pragmatic framework for transition, it also creates room for ambiguity if not backed by stringent enforcement mechanisms. The absence of a comprehensive compliance monitoring system and third-party verification requirements may allow environmentally harmful projects to be misclassified, thus undermining the credibility of the entire taxonomy framework. To avoid this, robust oversight and accountability mechanisms are essential.

Recognizing these challenges, the Indonesian Financial Services Authority (OJK) has committed to refining and expanding the taxonomy in future iterations. Planned updates include the incorporation of social and governance dimensions, which will transform the existing framework into a more holistic sustainable finance taxonomy. Additionally, future versions are expected to include more granular technical screening criteria[106] and enhanced alignment with regional standards, particularly the guidance issued by the ASEAN Taxonomy Board. These developments aim to ensure that the taxonomy remains dynamic, science-based, and responsive to evolving sustainability standards at both regional and global levels.

To support the long-term effectiveness of the IGT, several strategic policy interventions are required. First, capacity-building efforts should be intensified, with a focus on enhancing technical knowledge among financial institutions, regulators, and corporate issuers. Second, the government should consider implementing targeted incentive mechanisms — such as tax incentives, preferential interest rates, or regulatory relief — to encourage the adoption of taxonomy-aligned investment practices. Third, fostering public–private partnerships will be essential for co-developing sectoral standards, data repositories, and sustainability reporting frameworks. Lastly, establishing a transparent monitoring and enforcement system, potentially involving independent reviewers or certification bodies, will be vital to ensuring credibility, preventing greenwashing, and maintaining stakeholder trust.

In conclusion, the introduction of a sustainable finance taxonomy in Indonesia marks a significant milestone in the country's green finance agenda. By adapting international best practices to its national context and introducing a flexible, phased classification system, the IGT illustrates Indonesia's commitment to steering its economy toward long-term environmental sustainability and resilience. Although the taxonomy is still in its early implementation stage, it has already begun to influence financial sector behavior and capital allocation decisions. Ensuring its continued relevance

[106] ASEAN Taxonomy Board (2021). *ASEAN Taxonomy for Sustainable Finance: Version 1*. ASEAN Secretariat.

and effectiveness will depend on sustained institutional strengthening, improved data infrastructure, and deeper international collaboration. Through these measures, Indonesia can not only enhance its domestic sustainability outcomes but also solidify its position as a leader in the global sustainable finance landscape.

CHAPTER 4: *Comparative Analysis*

In the intricate dance between finance and sustainability, taxonomies serve as both compass and choreography. They map out what is deemed "sustainable" within an economy, offering guidance to investors, regulators, and institutions navigating the uncertain terrain of ecological transition. Yet, these taxonomies are not composed in unison — distinct sovereign hands draft them, each inflected with its own philosophical, economic, and environmental priorities. The European Union, China, the United States of America, and Indonesia have all undertaken the formidable task of crafting sustainable finance frameworks, yet their divergent approaches speak volumes about global dissonance and opportunity alike. It is precisely within this divergence that comparative inquiry becomes essential.

A comparative analysis does more than place taxonomies side by side; it interrogates the ideological substrata that underlie them. The EU's taxonomy, with its rigorously science-based structure and binary "substantial contribution" criteria, represents a normative aspiration for global harmonization, shaped by the Green Deal and the Sustainable Finance Disclosure Regulation. China's taxonomy, historically focused on green industries, emerges from a state-driven developmental logic, but has recently shown a trend toward convergence with global standards through its Common Ground Taxonomy project. The United States, in the absence of a federal taxonomy, reflects a fragmented but dynamic landscape driven by market initiatives and state-level policies. Meanwhile, Indonesia's "traffic-light" classification system, distinguishing between green, transition, and harmful activities, represents a pragmatic and context-sensitive model tailored to the developmental and ecological urgencies of the Global South.

This chapter proposes that comparative analysis is not merely academic — it is instrumental. By scrutinizing the structures, terminologies, sectoral coverage, and regulatory mechanisms of each taxonomy, we illuminate the tensions between environmental integrity, economic competitiveness, and social equity. Moreover, such analysis enables mutual learning, regulatory interoperability, and the identification of best practices — vital outcomes for a world that, while governed by sovereign mandates, shares a singular planetary fate. Thus, through the prism of comparative study, we do not merely observe differences; we unearth the harmonies and contradictions that shape our collective green transition.

4.1 Contrastive Review

The EU Taxonomy is explicitly designed to align with the Paris Agreement and EU climate goals.[107] According to such Taxonomy, an economic activity is "sustainable" if it makes a substantial contribution to at least one of the six environmental objectives and does no significant harm (DNSH) to the others, according to strict technical criteria (with quantitative thresholds for greenhouse gas

[107] Climate Bonds Initiatives. (2019). Comparing China's Green Bond endorsed Project Catalogue and the Green Industry Guiding Catalogue with the EU Sustainable Finance Taxonomy. *Climate Bonds Initiative*. https://www.climatebonds.net/files/documents/publications/comparing_chinas_green_definitions_with_the_eu_sustainable_finance_taxonomy_part_1_en_final.pdf#:~:text=Regarding%20environmental%20objectives%2C%20economic%20activities,safeguards%20and%20technical%20screening%20criteria

emissions and sector-specific metrics)[108]. The EU taxonomy is not mandatory, in spite of the regulatory framework: industrial companies and financial businesses can continue to invest, say, in coal and oil, but cannot pretend to call them sustainable investments; at the same time large EU companies will have to disclose how their activities align with it under the Corporate Sustainability Reporting Directive (CSRD), and financial products must report alignment percentages. The EU Taxonomy can be adopted by Governments in their laws and investment plans, by banks in their policies and loans, by businesses in their plans and strategies, if they so wish; if adopted as a rule, it may therefore become mandatory because considered useful. The adoption will depend on the credibility and robustness of the EU taxonomy which has been approved at European level, but in itself the EU Taxonomy is just a "classification" of investment and activities. It is up to institutions and businesses to use it.

China's approach is different: rather than a single overarching law, China has issued guidance documents such as the *Green Bond Endorsed Project Catalogue* by the People's Bank of China and the *Green Industry Guiding Catalogue* by the National Development and Reform Commission (NDRC). These catalogues list eligible projects and industries for green finance, but do not embed the Paris-2050 target as explicitly as the EU. For example, China's green bond catalogue was "set up for the green bond market with specific purposes" (to define green bonds and curb greenwashing) and it lists six environmental objectives, but it does not specify quantitative GHG thresholds[109] or exclude fossil-fuel projects outright**.** In fact, Chinese guidelines historically did not categorically ban fossil activities (e.g. clean coal) from being labelled green. The CBI's analysis notes that "specific and quantitative carbon emission thresholds […] seem to be missing from the Chinese taxonomy".[110]

The United States has no official sustainable finance taxonomy to date. Unlike the EU or China, U.S. regulators have not adopted a unified classification system for green activities. Instead, U.S. efforts have focused on disclosure (e.g. SEC climate risk rules) and voluntary standards (e.g. ICMA Green Bond Principles, Climate Bonds Standard, Taskforce on Climate-related Financial Disclosures – TCFD, etc.). The SEC has begun requiring certain climate-related disclosures, but these are reporting rules, not an economic activity classification system. As a result, U.S. sustainable finance guidance remains fragmented: companies can claim "green" credentials under various private frameworks, and investors often use general ESG benchmarks. In summary, the U.S. lacks a *regulated taxonomy*, making it an "outlier"[111] globally.

Indonesia's taxonomy is structured around four environmental objectives – climate mitigation, climate adaptation, ecosystem and biodiversity protection, and circular economy – in line with ASEAN and national goals. It introduces a three-tier traffic-light system[112]: *Green* for activities with clear environmental benefit (no significant harm); *Yellow* (Transitional) for activities moving towards

[108] Only minimum safeguards are included in the initial version, full social objectives are planned to be developed later.
[109] Climate Bonds Initiatives, 2019. Refer to footnote 107
[110] Climate Bonds Initiatives, 2019. Refer to footnote 107
[111] Compliance E-Learning, LMS & Authoring Tool (2024, February 7). *ESG regulations between the EU and the US*. | Datafisher. https://datafisher.com/news/esg-regulations-between-the-eu-and-the-us/#:~:text=In%20contrast%20to%20the%20EU%2C,or%20Sustainability%20Accounting%20Standards%20Board
[112] Saio, R. (2025, July 25). *Indonesia Green Taxonomy 1.0: Yellow does not mean go*. CPI. https://www.climatepolicyinitiative.org/indonesia-green-taxonomy-1-0-yellow-does-not-mean-go/#:~:text=Indonesia%20Green%20Taxonomy%201,from%20a%20view%20of%20sustainability

sustainability; and *Red* for harmful activities. The Indonesian taxonomy is currently voluntary guidance issued by the Financial Services Authority (OJK). Notably, the 2024 revision explicitly creates a transitional category for new fossil-based projects.[113] In principle, it aligns broadly with ASEAN's taxonomy framework, but in practice Indonesia's criteria have proven more permissive on fossil fuels than most peers.[114]

Another key difference is how these taxonomies are enforced. The EU taxonomy becomes mandatory for certain firms if other regulations/directives/laws adopt it as mandatory: for example, financial market participants (investment funds, insurance-based products, banks, etc.) must disclose taxonomy alignment under EU law, and large corporates' CSRD reports must include taxonomy alignment metrics. This legal backing gives the EU taxonomy strong credibility and "bite." In contrast, China's taxonomy documents are voluntary guidelines for issuers of green bonds or loans. For example, China's Green Bond Catalogue serves as a "guiding principle" for bond issuance[115] but is not legally binding. Thus, Chinese firms may follow it to tap the green finance market (and often do to access international investors), but failure to meet the criteria carries no regulatory penalty. Likewise, Indonesia's taxonomy is currently voluntary, though Indonesian regulators have indicated that mandatory disclosure might be phased in later. In the U.S., there is no national taxonomy to enforce; rather ESG labelling remains a question of marketing standards and evolving securities laws.

This contrast creates practical implications. Voluntary taxonomies (China, Indonesia, USA) tend to have weaker incentives to stay consistent with the latest climate science, whereas disclosure mandatory regimes (EU) can integrate strict climate targets. For example, one analysis of Asian taxonomies notes: *"Most Asian taxonomies are voluntary and lack the EU's mandatory disclosure mechanisms. This raises concerns about the effectiveness of these frameworks in combating greenwashing"*.[116] Indeed, voluntary systems have sometimes allowed leniency: China's taxonomies, at least historically, did not prohibit projects that the EU would flag as greenhouse-intensive; and Indonesia's latest rules explicitly allow some coal projects under the transitional banner.[117] By contrast, the EU's legal framework enforces both "substantial contribution" and "do not harm" conditions as legal requirements.

All four frameworks aim to promote climate mitigation, but they vary in scope and environmental breadth. The EU taxonomy's six objectives span climate (mitigation and adaptation) and broader environment (water, pollution, waste and biodiversity). China's guidance nominally uses six objectives as well but, in practice, the focus has been more on specific industries (construction, transport, clean energy) and less on aligning with precise climate targets. China's industry catalogue (NDRC) even focuses primarily on pollution control[118] rather than climate per se. The Indonesian taxonomy explicitly lists four objectives (two climate-related, plus biodiversity and circular economy) and uses the ASEAN taxonomy's broader set of criteria. The U.S., lacking a taxonomy,

[113] See below, for better understanding
[114] Ramnath Iyer (2024, February 27). *Will the new Indonesian Taxonomy for Sustainable Finance really serve its national interest?*. IEEFA. https://ieefa.org/resources/will-new-indonesian-taxonomy-sustainable-finance-really-serve-its-national-interest#:~:text=established%20up%20until%202030%20are,considered%20eligible
[115] Climate Bonds Initiatives, 2019. Refer to footnote 107
[116] Ramnath Iyer. Refer to footnote 114
[117] See below, for better understanding
[118] Climate Bonds Initiatives, 2019. Refer to footnote 107

has no official listed objectives – but any voluntary "taxonomy" would likely prioritize climate change (mitigation and adaptation) given U.S. policy emphasis, potentially along with energy security.

Sector coverage differs too. The EU taxonomy covers almost all sectors via NACE codes: agriculture, manufacturing, energy, transport, buildings, etc. It even includes transitional activities in heavy industry if they meet stringent thresholds. China's catalogue is organized by industrial sector codes (China's National Economic Codes), but its screening has no fixed taxonomy of activities like the EU; instead it has a list of broadly defined eligible projects. The Indonesian taxonomy covers many sectors but uses category-based criteria (e.g. all coal plants are red except those meeting special conditions in yellow) rather than detailed activity lists. In the U.S., industries are self-classified under voluntary labels, so coverage is uneven and determined by market practice rather than a central code list.

A major point of comparison is how strict each taxonomy's criteria are, especially regarding greenhouse gas (GHG) limits. The EU taxonomy sets quantitative thresholds for many activities. For example, it specifies a maximum emission intensity (e.g. gCO_2e/kWh) for power generation to qualify as taxonomy aligned. It also explicitly *excludes* unabated fossil fuel activities (no new coal, no nuclear until recently)[119]. Moreover, it requires a *"Substantial Contribution"* to an objective and imposes DNSH criteria and social safeguards.

By contrast, China's green bond catalogue and industry catalogue do not impose global carbon caps or explicit emission benchmarks. In the 2021 PBoC Green Bond catalogue, there are no quantitative GHG thresholds and no categorical ban on fossil fuel projects. Indeed, the catalogue's screening criteria state *"No carbon emission threshold… Does not exclude fossil fuels"*[120]. For example, "clean coal" (ultra-supercritical coal plants meeting efficiency criteria) was once allowed under China's green bond rules. Analysts note that China's taxonomy lacks the specificity of the EU's: whereas the EU and international standards commit to net-zero by 2050, "such specificity seems to be missing from the Chinese taxonomy"[121]. The Chinese guidelines do emphasize high-impact environmental projects (e.g. renewables, efficient transport) but allow a broader range of "green" industrial activities, often motivated by industrial policy rather than strict climate science.

The U.S. has no fixed taxonomy criteria. U.S. "green bonds" and funds typically follow voluntary standards (e.g. ICMA's Green Bond Principles or the Climate Bonds Standard), which emphasize certain activities but do not have an official reference list. Thus, a U.S. renewable energy project might be deemed "green" by one fund manager under a self-selected framework and not by another, leading to inconsistency. The lack of an official taxonomy means there is no U.S. regulatory definition of sustainability eligibility.

Indonesia's taxonomy attempts some criteria setting. For most sectors, it defines conditions for Green vs. Transitional vs. Red categories. For example, manufacturing of certain products might be Green if it meets efficiency benchmarks. Importantly, as previously highlighted, Indonesia's

[119] Climate Bonds Initiatives, 2019. Refer to footnote 107
[120] Climate Bonds Initiatives, 2019. Refer to footnote 107
[121] Ehlers, T., Gao, D., & Packer, F. (2021)

taxonomy draws heavily on the ASEAN framework**:** it includes a requirement that coal plants must emit below 510 gCO_2/kWh[122] to be Transitional (Yellow) and must retire by 2050. This threshold is actually quite lenient. Activities failing the criteria fall into Red (non-qualifying). Compared to the EU, Indonesia's thresholds are higher (less ambitious) and its treatment of transition is more permissive. For instance, under the ASEAN taxonomy a 510 gCO_2/kWh coal plant is high emitting "Level 3" and planned to be phased out by 2030, but Indonesia's 2024 taxonomy still allows such plants in the Yellow category without a sunset date.

How taxonomies treat controversial sectors like coal, oil/gas, and nuclear power highlights their differences. The EU taxonomy's stance has been to exclude unabated fossil fuels; the original regulation banned new coal plants and limited gas/nuclear inclusion; In 2022-23 with a decision at political level (Council of heads of state and government) the EU decided to allow new gas and nuclear, triggering debate; related technical transitional criteria, still remain very strict. Importantly, under EU rules *"fossil fuel activities without carbon capture"*[123] are explicitly excluded, and any taxonomy-aligned gas plant must meet aggressive emissions cuts[124] by 2035 or so. Nuclear was initially omitted[125], then re-included with limits (though critics say nuclear still fails DNSH on waste and water).

China's taxonomy historically has been more accommodating to fossil-related projects, reflecting its energy mix. The Chinese Green Bond Catalogue explicitly allows fossil projects that are deemed cleaner or efficient; for example, coal-fired plants with ultra-supercritical boilers were listed as eligible under certain conditions. Indeed, climate risk disclosure requirements in China do not forbid coal investments classified as green. In practice, however, Chinese green bond issuers focus on clean energy to attract international investors, but Chinese guidelines themselves are not centered on outright exclusion. China's approach has been described as lacking strict anti-coal criteria.

In the U.S., there is no official taxonomy stance, but market practice has effectively excluded coal from "green" projects (green bonds issuers rarely label coal projects as green) and is cautious on oil/gas. However, voluntary standards differ: the Climate Bonds Standard (UK-based but used globally) excludes "brown" activities and would not certify standard coal, but U.S. funds have historically financed natural gas infrastructure as transitional. Nuclear energy has mixed treatment; some U.S. green bond standards exclude it due to waste concerns, though some investors accept nuclear as climate friendly. Since there is no official taxonomy, U.S. treatment is determined by private consensus (and is currently ambiguous).

Indonesia's taxonomy garnered international attention by explicitly classifying certain new coal power plants as "Transitional (Yellow)" if they meet specific conditions. Indonesia justified this by noting some coal plants power critical mining/refining for batteries and EVs. In practice, the rules say that a coal plant under a transition plan (including 35% emissions reduction by 2030 and 2050 retirement) can be Yellow. Critics have pointed out the contradiction: allowing new coal under the

[122] Ramnath Iyer. Refer to footnote 114
[123] Climate Bonds Initiatives, 2019. Refer to footnote 107
[124] Segal, M.,(2022, January 25). *EU's Expert Advisory Panel Opposes Gas, Nuclear Inclusion in Green Taxonomy*. ESG Today. https://www.esgtoday.com/eus-expert-advisory-panel-opposes-gas-nuclear-inclusion-in-green-taxonomy/#:~:text=Under%20the%20draft%2C%20the%20expert,and%20water%20and%20marine%20Taxonomy
[125] Segal, 2022. Refer to previous footnote

taxonomy seems neither science-based nor aligned with Paris goals. Thus, unlike other Asian taxonomies (which commonly ban coal entirely), Indonesia stands out for its leniency on coal. On nuclear energy, Indonesia has none to date (and Indonesia is not a nuclear country), so the taxonomy is effectively silent.

Regarding governance and legal context, we notice that the EU Taxonomy is embedded in EU law. Regulation 2020/852 mandates technical screening criteria for 67 economic activities under the first two objectives (mitigation/adaptation). It also includes "minimum social safeguards" (based on ILO standards)[126] and explicit DNSH tests. Its criteria are set by EU delegated acts, subject to approval by the European Parliament. This gives it legal force for all EU member states and companies operating there. The EU also enforces taxonomy via regulatory instruments: banks factor taxonomy alignment into risk management, and Member States may use it in public finance. The process is highly consultative, involving the EU Platform on Sustainable Finance, but it remains a top-down design.

At the same time, it should be acknowledged that the EU Taxonomy, along with other components of the EU Sustainable Finance Strategy, has largely been designed in close consultation with experts from the financial sector. Given the highly technical nature of sustainable finance, such reliance on financial expertise appears both necessary and pragmatic, as it would be unrealistic to expect direct involvement from individual citizens in determining the sustainability of investment activities. This approach, however, reflects a predominantly top-down process of policy design, in which decision-making authority is concentrated among institutional and market experts. While concerns could have arisen regarding the potential for regulatory capture or disproportionate influence by privileged stakeholders and vested interests, such risks have thus far not materialized in a significant way.

China's taxonomies are government-led, but in a different way. The NDRC and PBoC (often with the China Securities Regulatory Commission) issue catalogues and guidelines; these are not laws but part of industrial policy. For example, the Green Bond Endorsed Projects Catalogue was issued by PBoC in 2015 (updated 2021) along with official Green Bond Guidelines. *These guides were developed following study tours to the EU and France, but they tailor to Chinese conditions*.[127] Enforcing them relies on market discipline: banks and companies seeking green bond labelling will follow them. The catalogues are periodically updated by Chinese regulators (e.g. the 2022 edition added offshore wind, fuel cell projects, etc.), reflecting China's evolving priorities. Unlike in the EU, compliance is signaled by adherence to the catalogue (e.g. obtaining a green bond certificate). As climate awareness grows in China, the catalogues may tighten over time, but so far they remain more lenient than EU law.

In the United States, sustainable finance governance is fragmented. No single agency is in charge of a taxonomy (as none exists). The closest analogues are the SEC (which regulates securities disclosure) and the Commodity Futures Trading Commission (CFTC, which has considered climate risks). Neither has produced an "official taxonomy." Instead, financial regulators have proposed or implemented disclosure rules: for example, in 2022 the SEC proposed climate risk reporting rules (subject to legal challenges) and the Department of Labor has clarified fiduciary duties regarding ESG. At the same time, industry bodies (like ICMA) set voluntary Green Bond Principles; major

[126] Climate Bonds Initiatives, 2019. Refer to footnote 107
[127] Climate Bonds Initiatives, 2019. Refer to footnote 107

investors often form coalitions (GFANZ, WEF initiatives) to encourage taxonomy convergence, but these have no legal force. The result is that "sustainable finance" in the U.S. is largely steered by the market[128] and civil society rather than uniform regulation. Recently (2024-25), some U.S. States have created their own "green taxonomies" or registers of sustainable projects (e.g. New York's Green Bank charter), but these are limited in scope.

Indonesia's taxonomy is overseen by OJK (Financial Services Authority) and coordinated with other ministries (Environment, Energy, etc.). The first green taxonomy (2022) was instituted under OJK regulations (POJK 51/2017 originally, updated in 2022 with Indonesian Taxonomy for Sustainable Finance). The 2024 version remains a regulation but explicitly labels itself as guidance; mandatory disclosure of taxonomy-aligned financing is planned under future sustainable finance regulations. Indonesia, like the EU, adopted a stakeholder process to update its taxonomy, including public comment. However, the Indonesian system is less legally rigorous: while companies may be expected to use the taxonomy in reporting sustainability efforts, compliance is not yet tied to specific penalties. In short, the EU taxonomy is the most easily adoptable to become a regulation or to be inserted into evaluation criteria; Indonesia's is regulated in form but flexible in content; China's and Indonesia's are more "soft law"; and the U.S. has no formal taxonomy law at all.

4.2 Critiques and Controversies

Several fundamental divergences become apparent through this comparative analysis. The EU taxonomy is widely seen as the strictest in climate terms. It is explicitly aligned with limiting warming to 1.5°C and the net-zero by 2050 goal. This is evident in its carbon thresholds and emphasis on DNSH. By contrast, Indonesia's and China's taxonomies are more permissive. They both allow some fossil-related activities (new coal for Indonesia, "clean coal" and oil/gas in China) under certain labels, which many scientists argue undermines Paris alignment. Researchers have characterized Indonesia's taxonomy as "least stringent"[129] in Asia. The U.S. arguably has an even *lower* bar since any project can be called "green" by its backers unless officially contradicted.

The EU's criteria are highly detailed (over 100 pages of technical criteria were produced by the expert group). It specifies performance bars for each activity (e.g. emissions per kWh for power, efficiency metrics for industry). China's catalogues are less granular; they typically describe project categories in narrative form (e.g. "hydropower with high head", "ultra-supercritical boilers") without a uniform measure of performance. Indonesia's taxonomy provides sectoral criteria but often in broad terms (e.g. circular economy activities) or with thresholds that many consider too lenient. The U.S. has *no centralized criteria* to judge sustainability, making comparability difficult.

The EU taxonomy is exclusively focused (for the time being) on environmental objectives, though social considerations are addressed with the minimum social safeguards and in separate initiatives (e.g. due diligence regulation). China's green finance framework similarly focuses on environmental

[128] Peters, A. (2023, May 22). *Global taxonomies battle risks undermining green finance*. Banking Risk and Regulation. https://www.bankingriskandregulation.com/global-taxonomies-battle-risks-undermining-green-finance/#:~:text=Dozens%20of%20countries%20have%20embarked,US%2C%20an%20outlier%2C%20fit%20in

[129] Alarcòn, S., & Miranda, T. (2023). Unlocking Sustainable Finance: Green and Sustainable Taxonomies. In *Institute of the Americas*. Institute of the Americas. Retrieved July 13, 2025, from https://www.iamericas.org

and climate aspects; it does not systematically address social issues. Indonesia's taxonomy also centres on environmental/climate objectives. Notably, Indonesia's revised taxonomy explicitly maintains a focus on environment to align with national and ASEAN priorities and does not incorporate social metrics beyond what is in the Indonesian sustainable finance regulation. In contrast, some U.S. ESG frameworks emphasize social factors (labor, diversity) alongside environmental issues, but these are not part of a unified taxonomy. In sum, all four taxonomies under review are "green" in focus (some call them "environment taxonomies") rather than full ESG taxonomies.

The divergence among taxonomies has raised concerns about fragmentation. With dozens of taxonomies worldwide, investors face a confusing landscape[130]. For instance, an activity deemed taxonomy-aligned in China might not qualify under the EU rules, and vice versa. The EU-China Platform on Sustainable Finance has explicitly noted "little convergence"[131] between the EU and Chinese taxonomies in objectives, scope and disclosure requirements. This inconsistency creates *"taxonomy arbitrage"*: investors might favor projects that meet the laxer standards of one taxonomy but would be excluded by another. Many observers argue that such fragmentation undermines trust. The A&O Shearman analysis warns that lack of harmonization "impedes efficient cross-border capital flows and creates confusion"[132] for companies operating in multiple markets.

Indonesia's taxonomy has sought to align with ASEAN and avoid the very broad categories seen in some national frameworks, but its permissiveness on coal raises interoperability issues with peers. For example, an Indonesian coal plant project might receive finance as "Yellow" under Jakarta's rules but would clearly be non-compliant under EU or even ASEAN criteria. The EU has even taken steps to influence other taxonomies: most recently, the EU and China co-developed an "EU-China Common Ground Taxonomy" to identify overlapping sustainable activities (though that CGT remains a non-binding report, meant to foster convergence). Nonetheless, significant discrepancies remain.

The EU's taxonomy is often criticized for its complexity and technical detail. Some industry groups have worried it could become a mere "boilerplate"[133] disclosure exercise, requiring cumbersome data (some firms have described compliance as a "mission impossible" due to data gaps). The flip side is that taxonomies that are too vague invite greenwashing. For example, critics of China's and Indonesia's taxonomies argue that without hard rules many projects could falsely claim green credentials. The IEEFA report on Asia notes that well-designed taxonomies *"should establish clear definitions, science-based criteria and stakeholder engagement mechanisms"*[134]; by that standard, the more principle-based approaches in Asia fall short. In particular, the IEEFA and CPI analyses point out that Indonesia's and China's versions contain *"lax or aspirational"* criteria[135], which risk

[130] A&O Shearman (2024). *Taxonomies - why the world needs harmonization but not uniformity*. Retrieved July 13, 2025, from https://www.aoshearman.com/en/insights/ten-lessons-in-sustainability-regulation/taxonomies-why-the-world-needs-harmonization-but-not-uniformity
[131] Allen & Overy (2024). *Ten Lessons in Sustainability regulation*. A&O Shearman
[132] Allen & Overy (2024). Refer to footnote 131
[133] Azizuddin, K., (2024, October 22). *Criticisms against taxonomy could fuel 'green policy rollback', says PSF chair*. Responsible Investor. https://www.responsible-investor.com/criticisms-against-taxonomy-could-fuel-green-policy-rollback-says-psf-chair/#:~:text=Pushback%20from%20Helena%20Vi%C3%B1es%20Fiestas,could%20become%20%27boilerplate%27%20compliance%20exercise
[134] Ramnath Iyer. Refer to footnote 114
[135] Saio, R. (2025, July 25). Refer to footnote 112

permitting projects that undermine climate goals. Conversely, the EU taxonomy is sometimes criticized politically (by coal-reliant member states or nuclear advocates) but it generally wins praise for rigor and preventive power against greenwashing.

A major policy debate is how to include high-carbon industries that need to decarbonize. The EU taxonomy introduced the concept of *"transitional"* activities (sometimes called "amber") that are not yet green but move towards low-carbon. These have very strict conditions (e.g. must have emissions substantially below sector average and a credible decarbonization plan). China and Indonesia also allow transitional activities, but with different scopes. China's guideline effectively allows any project that brings pollution reduction or efficiency, even if it is in a traditionally dirty industry, to be labelled green. Indonesia explicitly created a Yellow category to attract financing for its energy transition (including coal-to-battery mining complexes). The EU's current taxonomy has no "yellow" label (it is green vs. unsustainable) – although the Platform on Sustainable Finance is now exploring a broader taxonomy that could include intermediate categories. In practice, Indonesia has gone further in embracing transitional coal projects than the EU would (even under proposed rules).

[Figure 10]: Illustrative comparison of EU, China, USA and Indonesia Taxonomies. Our elaboration.

FEATURE	EU Taxonomy (Reg. 2020/852)	China (Green Bond/Industry Catalogues)	United States (Market-Driven)	Indonesia (OJK Taxonomy)
Legal Status	Mandatory EU regulation (applicable law in all Member States).	Voluntary guidance (Green Bond Catalogues) and industry lists (NDRC).	No official taxonomy; voluntary standards (Green Bond Principles, Climate Bonds).	Voluntary guidance (OJK regulation); mandatory disclosure planned
Environmental Objectives	Six objectives (climate mitigation & adaptation; water; circular economy; pollution; biodiversity).	Six broad objectives (energy saving, pollution control, resource conservation, etc.) but emphasis on pollution & green industries.	No formal list; focus implicitly on climate mitigation/adaptation via policy.	Four objectives (climate mitigation, climate adaptation, biodiversity, circular economy).
Classification	Based on NACE economic activity codes; detailed activity list.	Based on Chinese industrial classification codes; project categories (e.g. power, transport).	No official classification; companies self-label activities per voluntary frameworks.	Sector categories aligned with ASEAN taxonomy; traffic-light system
SCREENING CRITERIA	Substantial Contribution to at least one objective and Do-No-Significant-Harm to others; specific performance thresholds (e.g. emission intensity) for each activity.	No universal principle or carbon threshold; broad eligibility statements for "green" projects; allows fossil under certain efficiency conditions.	No central criteria Voluntary green bond standards exist but not government-enforced.	Qualitative criteria for each color: green = no harm; yellow = sustainable transition red = non-eligible. E.g. coal ≤510 gCO_2/kWh to be Yellow.
FOSSIL and NUCLEAR Treatment	Unabated fossil fuels excluded; nuclear and gas initially excluded, later added as "transitional" under strict conditions (e.g. emission limits, no harm)	Does not categorically exclude fossil fuels (e.g. "ultra-clean coal" was allowed, natural gas included); no mention of nuclear.	No official rule. Market practice generally excludes coal for green bonds; nuclear and gas optional per issuer's view.	New coal plants can be Yellow (transitional) if they meet efficiency and retirement conditions; existing coal generally Red. No nuclear.
Alignment with Paaris Goals	Explicitly aligned with EU 2050 net-zero target; criteria reflect 1.5°C pathways.	Implicitly supports "ecological civilization" goals; less explicit on net-zero by 2050.	No government stance on Paris alignment; US rejoined Paris 2021 but no taxonomy effect.	Stated to support national NDC, but allowing new coal is controversial with Paris commitments.
Implementation	Companies/financial institutions must report alignment (via CSRD, SFDR, etc.); used in EU banking/finance rules.	Banks/issuers follow guidelines voluntarily; often require 2nd-party opinion to show alignment.	Rely on voluntary disclosures (CDP, TCFD) and standards; some SEC climate disclosure required soon.	Banks and corporates encouraged to align loans and green bonds to the taxonomy; disclosure may become mandatory.

Beyond structural differences, each taxonomy has drawn specific criticisms. To promote a better understanding, please refer to **Figure 10**, which illustrates a schematized summary of the aspects mentioned previously.

EU Taxonomy

Supporters of the EU Taxonomy praise its scientific basis and transparency, but critics cite complexity and political compromises. The taxonomy's heavy technical content can be difficult for companies to implement, and some small market participants warn of a burdensome "box-ticking"[136] exercise. Politically, the EC faced pushback by the Council on excluding initially nuclear and gas. In 2021-2022, after much debate, the EU agreed to allow some new nuclear and gas as transitional activities under tight conditions (e.g. gas plants must switch to hydrogen or ensure low lifecycle emissions by 2035). However, the expert Platform on Sustainable Finance warned that the proposed gas/nuclear criteria *"allow GHG emissions above the DNSH level"* and may not ensure "substantial contribution"[137]. Several EU politicians and NGOs objected: Austria and Germany opposed including nuclear, and environmental groups said adding gas could undermine the taxonomy's integrity. Meanwhile, some industry observers argue the Taxonomy may have little effect if companies simply label existing projects as green to meet disclosure requirements without real change (a form of regulatory capture). In summary, while rigorous, the EU taxonomy continues to evolve under scrutiny.

China's Taxonomy

China's green finance taxonomy is often criticized as insufficiently ambitious. Analysts note[138] that it was designed to serve China's industrial policy as much as climate policy. For instance, China's Green Industry Catalogue was built on the notion of promoting designated "green" industries; it highlights pollution control and resource conservation but lacks enforceable emission targets. The fact that China did not exclude coal or gas from green definitions has raised eyebrows internationally. A BIS[139] study observes that while EU/US standards commit to carbon neutrality by 2050, the Chinese taxonomy does not; not even in 2060, the official target year adopted by the Chinese Government in the UNFCCC Framework. This suggests Chinese taxonomies risk being "China-centric" with looser criteria, potentially diluting their climate effect. On the other hand, China's massive mobilization of renewables and green bonds (driven by this taxonomy) has also been noted as a positive: the taxonomy has helped scale up green bond issuance and corporate green finance in China. Overall, the critique is that China's criteria are broad-brush and may allow projects that would not pass EU muster, thus raising concerns about consistency with global goals.

United States Taxonomy

Without a formal taxonomy, U.S. policy is criticized for incoherence. Observers say that the U.S. has been slow on sustainable finance regulation: a "divided policy environment" and changing

[136] Azizuddin (2024). Refer to footnote 133
[137] Segal, 2022. Refer to footnote 124
[138] Climate Bonds Initiatives, 2019. Refer to footnote 107
[139] Ehlers, T., Gao, D., & Packer, F. (2021)

administrations have produced only piecemeal action. Some States actively ban ESG considerations, further fragmenting the landscape. Because ESG labels are voluntary, critics warn of greenwashing: companies could market a product as "ESG" with little evidence. On the positive side, some U.S. investors argue that voluntary frameworks allow flexibility and innovation. Nevertheless, the consensus is that the U.S. "lags behind" the EU and even China in providing clear taxonomy guidelines. Peters analysis[140] bluntly calls the US an "outlier," noting that dozens of countries have taxonomies, but the US does not.

Indonesia Taxonomy

Indonesia's taxonomy has been sharply criticized by NGOs and analysts for being too lenient on coal. The 2024 revision triggered controversy because it reclassified some new coal plants (used for processing minerals) as transition assets rather than outright barred. Independent analysts (IEEFA) called this a "stretch" that undermines Indonesia's Paris commitments. They note that by allowing captive coal plants until 2050, Indonesia's taxonomy effectively increases coal demand by ~17%. Environmental groups (e.g. TuK Indonesia) have voiced disappointment that the taxonomy lacks science-based standards. In a broader view, Indonesia's criteria are far weaker[141] than international norms. This disjoints Indonesia's taxonomy from ASEAN standards (which plan to phase out high-emitting activities by 2030) and from EU-style rigor. Aside from coal, critiques point out that Indonesia's taxonomy is still mostly guidance, with uncertain enforcement; until it ties financing firmly to the taxonomy, many fear it will have limited impact.

The divergences described above underline a major critique: fragmentation across jurisdictions. The landscape of taxonomies is "far from ideal"[142] with overlapping yet inconsistent standards. For example, a developer wanting to build a green hydrogen plant might find that under the EU taxonomy it qualifies as green (if criteria met), under China's catalogue it likely qualifies as green too, but an Indonesian project might require different local approvals and be categorized uncertainly. A coal plant might be Red in the EU, Yellow in Indonesia, and even possibly "clean coal" green in China's list. This mismatched patchwork "undermines the credibility and effectiveness of the sustainability agenda"[143] warns a legal analysis.

Indeed, the IPSF International Platform on Sustainable Finance has noted the absence of convergence: *"The two taxonomies [EU and China] differ in objectives, scope, disclosure obligations and approaches to different activities"*[144]. Without harmonization, cross-border investors must juggle multiple definitions. This can lead to regulatory arbitrage, where capital flows to jurisdictions with looser taxonomies (the so-called "taxonomy-lite" approach).

Efforts to bridge gaps are underway: the EU-China Common Ground Taxonomy (CGT) identifies sectors with strong overlap between the two systems, and ASEAN members including Indonesia are developing a regional taxonomy. But these remain voluntary tools. Many experts conclude that while some national adaptation is inevitable, greater alignment would benefit all parties. As the BIS paper

[140] Peters (2023). Refer to footnote 128
[141] Ramnath Iyer. Refer to footnote 114
[142] Allen & Overy (2024). Refer to footnote 131
[143] Allen & Overy (2024). Refer to footnote 131
[144] Allen & Overy (2024). Refer to footnote 131

notes, taxonomies designed with common objectives and transparent KPIs could improve comparability across markets. In practice, however, geopolitical and economic factors also shape taxonomies, so full harmonization is unlikely without intense cooperation.

4.3 Discussion

The comparative analysis highlights both convergent goals and divergent methods. All four jurisdictions recognize the need to channel private capital into sustainable activities and to provide transparency on sustainability. The differences arise because of their policy contexts. The EU, as a bloc deeply committed to the Green Deal, imposed a strict taxonomy to ensure high environmental integrity, even at the cost of complexity and internal friction (e.g. over nuclear/gas). China, balancing rapid growth with environmental targets, opted for a more pragmatic taxonomy that steers its vast finance sector toward cleaner energy and industrial upgrades, but still accommodates legacy industries. The U.S., with its market-oriented philosophy and political polarization over ESG, has yet to codify any taxonomy; instead it leans on market forces and disclosure rules, hoping private standards can fill the gap. Indonesia, a developing country with high coal dependence, seeks to attract green finance and meet ASEAN norms, but its own economic interests (especially minerals) have shaped a relatively relaxed taxonomy.

The critique that arises is whether these taxonomies genuinely advance climate action or simply formalize loopholes. The EU's supporters argue that without enforceable rules like theirs, greenwashing and inadequate progress would be rampant. The EU taxonomy's defenders also point out that legal certainty (knowing what counts as green) is necessary for capital markets. Opponents of the EU approach say it risks freezing out necessary transitional technologies or overwhelming issuers with red tape. Conversely, China's and Indonesia's taxonomies face critiques that they may not meaningfully raise the bar on emissions. If "sustainable" finance in China still funds some coal, or in Indonesia funds new coal, critics claim it undermines the countries' own climate goals. In the U.S., critiques center on policy incoherence: even if America has the capital and innovation, without a clear taxonomy its finance may not align effectively with climate policy, and investors must navigate a patchwork of global standards.

At the global level, the disarray of taxonomies poses a question: *Should the world converge on one standard or allow multiple tailored taxonomies?*[145] The literature suggests a balance: convergence on fundamentals (Paris alignment, transparency) but flexibility for local conditions. The A&O Shearman analysis cautions that uniformity is impossible, but harmonization is critical: taxonomies should ideally share common objectives and comparable criteria where possible. Initiatives like the IPSF's Common Ground Taxonomy and ASEAN's cooperative effort are steps in this direction, though they remain voluntary.

In summary, the EU, China, USA, and Indonesia have each developed different sustainable finance taxonomies (or lack thereof) reflecting their priorities and governance models. The EU leads with a rigorous, well-defined taxonomy enshrined in law, aiming to leave no ambiguity about what is

[145] Note that such question will be addressed in the following chapter.

"green." China's taxonomy is more voluntary and flexible, intended to spur growth in green sectors but with fewer hard thresholds. The United States currently has *no government-defined taxonomy*, relying instead on voluntary disclosure standards and market norms. Indonesia's taxonomy sits between these: it follows ASEAN-style principles with mandatory classification colors but sets relatively lenient criteria (especially allowing some coal activity) compared to the EU or even other Asian peers.

The disparities have attracted criticism from climate and financial experts: too strict in one case, too lax in another; too detailed vs. too vague. Ultimately, the analysis reveals a trade-off between environmental ambition and political-economic reality. The EU taxonomy epitomizes ambition (and complexity); China and Indonesia reflect pragmatic breadth; the US exemplifies regulatory minimalism. Reconciling these approaches — through international dialogue, common metrics, or broad frameworks — remains an open policy challenge.

CHAPTER 5: *Broadening Taxonomies*

Taxonomies have long served as one of humanity's fundamental intellectual tools, a way of bringing order into the chaos of complexity. From Linnaean systems in biology to the intricate coding of industrial activities in modern economies, they reflect our perennial desire to classify, to differentiate, and to make sense of the multiplicity of life. In the contemporary context of sustainability, taxonomies have acquired a new significance. They are no longer simply descriptive or organizational instruments but are increasingly deployed as normative frameworks that define what is sustainable, what is permissible, and ultimately what is desirable. The rise of sustainable taxonomies has not been without controversy. On the one hand, they promise clarity in a field often clouded by ambiguity, signaling to investors and regulators alike which activities contribute to sustainability objectives. On the other hand, they risk being either too narrow to capture the full range of human, economic and ecological concerns, or too complex to be usable in practice.

Philosophically, the pursuit of perfection has always been woven into the fabric of human character; yet it must be recognized that such a path leads inevitably toward utopian constructs, luminous but unattainable, and ultimately misaligned with the contours of our lived reality. The creation of a *perfect* taxonomy is of course a conceptual ideal rather than a practical reality, since all classification systems operate under the constraints of data availability, political negotiation, scientific uncertainty, and institutional capacity. Nevertheless, describing the features of such an ideal model provides a normative benchmark against which existing taxonomies can be evaluated and future ones can be designed. This is essentially the pivot of this chapter.

At its core, a taxonomy is a classification system, but one that is more structured than a loose categorization and more flexible than a rigid standard. In sustainability debates, taxonomies differ from certifications or indices in that they are not limited to establishing a single performance benchmark. Rather, they seek to provide a comprehensive mapping of activities according to their contribution, or lack thereof, to broader environmental, social, and governance objectives[146].

The precise scope of a taxonomy can vary significantly. Some, such as the early iterations of the Chinese or European Union taxonomies, focused primarily on environmental aspects, especially climate change mitigation and adaptation. Others move toward integrating the full ESG spectrum, recognizing that environmental protection cannot be meaningfully separated from issues of social equity or governance integrity. The level of granularity also matters: a taxonomy that merely labels "renewable energy" as sustainable risks overlooking crucial differences between solar photovoltaics and large-scale hydropower with severe ecological costs. Equally, a taxonomy that attempts to distinguish every technological nuance may collapse under the weight of unmanageable complexity. The orientation toward objectives adds another dimension: some taxonomies adopt absolute criteria, declaring certain activities sustainable in any context, while others embrace transitional pathways, acknowledging that imperfect activities may still play a role in the move toward long-term sustainability.

[146] OECD (2020), *Developing Sustainable Finance Definitions and Taxonomies*, Green Finance and Investment, OECD Publishing, Paris, https://doi.org/10.1787/134a2dbe-en.

The answers to these questions of scope, granularity, and orientation determine not only how a taxonomy functions, but also how it is perceived by stakeholders. A system too narrow risks accusations of irrelevance, while one too broad or ambiguous risks accusations of greenwashing. The challenge lies in striking a balance that is at once rigorous, legitimate, and workable.

The evolution of taxonomies in the last decade offers instructive lessons. The OECD's comparative review of taxonomies[147] in jurisdictions including the European Union, China, Japan, France, and the Netherlands underscored both shared ambitions and divergent pathways. Across these systems, common environmental objectives such as climate change mitigation, biodiversity preservation, and the promotion of circular economy practices were evident. Yet their approaches varied: some adopted detailed technical screening criteria, others relied more heavily on qualitative descriptors, and still others foregrounded transition activities to reflect national circumstances. Through the previous comparisons brought out in this thesis we were able to arrive to similar conclusions. The OECD concluded that the value of taxonomies lies not only in their domestic utility but also in their potential to harmonize international capital flows, provided they are built with comparability in mind.

The Bank for International Settlements[148] similarly highlighted the unevenness of existing frameworks. Their analysis showed that many taxonomies remain vague in their indicators, lack sufficient granularity to differentiate among diverse activities, and often suffer from weak verification processes. The danger, in such cases, is that taxonomies designed to prevent greenwashing may themselves be co-opted as instruments of it.

The European Union's taxonomy remains the most ambitious attempt to date. Its six environmental objectives — climate change mitigation, climate change adaptation, protection of water and marine resources, transition to a circular economy, pollution prevention, and biodiversity protection — set a broad agenda[149]. It further distinguishes itself by incorporating the principle of "do no significant harm", ensuring that an activity contributing positively in one dimension cannot simultaneously inflict damage in another. Technical screening criteria, linked to the NACE industry statistical classification, anchor the system in measurable thresholds. Despite these strengths, the EU Taxonomy is not without flaws: the reporting requirements are complex, data gaps hinder implementation, and some sectors remain insufficiently covered. The result is a system that is at once a pioneering achievement and a living illustration of the difficulties inherent in designing comprehensive taxonomies.

Other sectoral examples reinforce these insights. Migdadi[150], in developing a taxonomy of airline environmental strategies, used cluster analysis to reveal patterns of engagement that would be invisible without a systematic classification. Similarly, Sica, Testarmata, and Migliaccio[151] proposed taxonomies of ESG indicators to facilitate sustainable investment decisions, demonstrating the

[147] Refer to previous footnote
[148] Ehlers, T., Gao, D., & Packer, F. (2021)
[149] Lucarelli, C., Mazzoli, C., Rancan, M., & Severini, S. (2020). *Sustainable Finance and Climate Transition: The Role of Taxonomy*. *Sustainability*. Sustainability vol. 12, no. 16, 2020
[150] Migdadi, Y. (2020). *A taxonomy of green airline strategies: patterns of configurations and implications*. Management of Environmental Quality: An International Journal, 10.1108/MEQ-03-2019-0067
[151] Sica, E., Testarmata, S., & Migliaccio, G. (2023). *ESG indicators and sustainable investments: Toward a classification taxonomy*. Sustainability 10.3390/su152215979

necessity of linking categories to measurable and comparable metrics. These examples show that taxonomies, when well-designed, can function not only as policy tools but also as lenses through which complex realities are rendered intelligible.

From the accumulation of practice and analysis, certain principles emerge as indispensable. A sustainable taxonomy must begin with clarity: clarity about its objectives, about whether it is designed to guide investment, regulation, or scientific analysis, and clarity about the sustainability dimensions it intends to capture. Without this definitional transparency, the system risks incoherence.

Scientific grounding is equally crucial. A taxonomy's legitimacy depends on its capacity to rest upon the best available knowledge, whether this is the IPCC's carbon budgets for climate objectives or IPBES assessments for biodiversity. When thresholds are scientifically anchored, they resist dilution by political compromise. Yet scientific legitimacy alone is insufficient. A taxonomy must also translate science into criteria that are measurable, verifiable, and auditable. It is in this conversion from knowledge to indicators that many frameworks falter.

Another principle is the enforcement of the "do no significant harm" requirement. An activity that advances one goal cannot be celebrated as sustainable if it simultaneously undermines others. Equally, a taxonomy must find the right degree of granularity: detailed enough to differentiate meaningfully, but not so intricate as to collapse under its own complexity. To remain relevant, it must be adaptive, designed as a living system capable of revision in light of new technologies, scientific evidence, and social values.

A sustainable taxonomy also demands interoperability. In a globalized economy, domestic classifications that cannot be mapped onto international frameworks risk reducing their utility and fragmenting markets. Finally, legitimacy requires inclusive participation and transparent governance. Without the involvement of diverse stakeholders — from scientists and industry to civil society and affected communities — taxonomies risk being perceived as technocratic impositions.

Having reviewed principles and practices, we can now sketch the contours of what a perfect sustainable taxonomy might look like. Such a system would be comprehensive, capturing environmental, social, and governance dimensions in an integrated manner. It would not limit itself to the mitigation of climate change but would also encompass biodiversity protection, labor rights, governance transparency, and community well-being. Sustainability is, after all, indivisible; an ecological gain purchased at the cost of social injustice is no true gain.

The perfect taxonomy would rest on evidence that is both robust and transparent. Climate criteria would be aligned with IPCC carbon budgets; biodiversity thresholds would follow IPBES resilience indicators; social standards would reflect internationally recognized human rights frameworks. Its criteria would be measurable, with indicators that lend themselves to verification, thereby closing the door to opportunistic claims of sustainability.

Crucially, this taxonomy would operationalize the "do no significant harm" principle with rigor. Renewable energy projects that devastate fragile ecosystems would not pass muster simply because

they displace fossil fuels. By distinguishing carefully between technologies, the system would avoid false equivalences and the masking of harm beneath the cloak of benefit.

A perfect taxonomy would also balance granularity and usability. It would differentiate between activities at a level sufficient to provide guidance but would avoid paralyzing detail. It would be dynamic, built for regular revision in light of new science and evolving social priorities. It would aspire to global comparability, allowing cross-border capital to flow without friction, while at the same time permitting local contextualization to account for diverse developmental realities.

The governance of such a taxonomy would be independent, transparent, and inclusive. It would be stewarded by a body free from capture, empowered with adequate resources, and accountable through clear mechanisms of oversight. And yet, for all its ambition, the perfect taxonomy would not burden actors beyond their capacity. It would adopt proportionality, requiring more from those with greater resources while ensuring that smaller enterprises are not excluded from the sustainable transition. Finally, it would not exist in isolation but would be woven into the broader policy fabric of international agreements, disclosure requirements, and regulatory instruments.

It is important to acknowledge that such a taxonomy, while ideal, inevitably encounters real-world tensions. Ambitious thresholds can foster legitimacy but risk excluding most activities; relaxed thresholds encourage participation but dilute meaning. Similarly, granularity can improve differentiation but also raise reporting costs. The push for universality may collide with the need for local sensitivity, just as adaptability may undermine stability for long-term investors. Data scarcity and uneven capacity pose further obstacles. These tensions are not reasons to abandon the project but to recognize the careful balancing act required in practice.

To imagine a perfect sustainable taxonomy is to imagine more than a regulatory instrument. It is to envision a framework that does not merely classify the present but guides us toward a different future. The ideal taxonomy would be comprehensive and just, grounded in science yet sensitive to human realities, rigorous in its demands yet pragmatic in its application. It would act as a compass, not a cage, pointing the way toward a horizon where economic activity and ecological integrity are reconciled.

And yet, as with all human instruments, such perfection remains aspirational. The real work lies in approximation, in the patient construction of systems that strive ever closer to the ideal, even as they fall short. Taxonomies are human creations, imbued with our values, our conflicts, and our hopes. They remind us that sustainability is not a static endpoint but a dynamic journey.

In this sense, the perfect taxonomy is not a finished edifice but a living architecture. It grows as our knowledge deepens, as our societies evolve, as our sense of justice matures. It embodies the humility of knowing that classifications will always be provisional, and the courage of setting standards high enough to inspire transformation. Like a map drawn in shifting sands, it cannot chart every detail of the landscape, but it can orient us toward the possibility of flourishing. To humanize taxonomies is, therefore, to see them not as sterile grids but as instruments of care — tools by which we attempt, however imperfectly, to hold the world together

CONCLUSION

At the outset of this thesis, the question was posed of how sustainable taxonomies can illuminate, guide, and even transform the pathways of global development. In tracing their evolution, their structures, and their limitations, it has become clear that taxonomies are far more than technical instruments of classification. They are mirrors of collective priorities, embodiments of political compromise, and vehicles through which societies attempt to translate the elusive ideal of sustainability into rules of practice and flows of capital.

The comparative analysis of the European Union, China, the United States, and Indonesia has demonstrated the diversity of approaches, each reflecting the distinct cultural, economic, and geopolitical circumstances from which it emerges. The EU has constructed a taxonomy rooted in scientific precision and legal rigor, designed as a normative global benchmark. China has articulated a framework aligned with its rapid developmental trajectory and industrial policies, privileging pragmatic decarbonization. The United States of America, fragmented yet inventive, reveals how political pluralism and regulatory competition complicate the creation of a unified standard. Indonesia, as a representative of the Global South, illustrates the potential of taxonomies to integrate developmental imperatives with ecological stewardship. Together, these cases underscore that taxonomies are not universal templates but situated constructs — contextually bound, yet globally consequential.

And yet, comparison alone is insufficient. This thesis has therefore proposed a vision to broaden taxonomies: to expand their scope beyond narrowly defined environmental criteria, to embed them more deeply in the interwoven dimensions of the social, ecological, and economic, and to ensure that they remain dynamic in the face of scientific progress and societal change. Such a broadened taxonomy would not merely catalogue sustainable activities but would serve as a compass, guiding financial systems and policy frameworks toward resilience, justice, and long-term flourishing.
The task ahead is daunting. To broaden taxonomies is to acknowledge their provisionality and to embrace the work of continuous negotiation. It is to recognize that sustainability is not a static endpoint but an ongoing process of recalibration between human aspiration and planetary limits. It is also to admit that taxonomies, though imperfect and contested, can nevertheless function as scaffolding for transformation — structuring choices, enabling accountability, and aligning economic flows with the values we claim to uphold.

In conclusion, sustainable taxonomies should not be seen merely as bureaucratic artefacts, but as expressions of a deeper human endeavor: the attempt to give structure to hope. They are imperfect architectures of meaning, fragile yet necessary bridges between the world as it is and the world as it must become. To broaden them is therefore not only a technical reform, but a moral imperative. It is to affirm that classification can be more than a constraint — it can be a call, a map, and a promise.

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