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TRANSITION(S)

STRATEGY | FINANCE | TRAINING

Just a few elements

- I am taking students who want to do PFE/PPP in the following areas :
  - Green Finance
  - Financial Economics
  - Energy Economics
  - Energy transition
  - + Entrepreunariat

- If you are interested, my company publishes a weekly newsletter with jobs / internships / alternance / VIE in the energy transition in the Region (and it's free) => https://lalisteverte.substack.com/

Green Finance:
from concepts to advanced instruments

Session 3: climate and valuation

Refresher

Main messages from previous sessions

- Climate risk is nearly impossible to correctly price-in and there are significant discrepancies in carbon prices
- Trillions of dollars need to be invested each year in order to shift the economy towards an environmentally sustainable path
- The market does not provide the necessary incentives for individual actors to make collectively rational decisions (tragedy of the commons)

- These are the structural problems we will be covering in this session

Pricing carbon

The multiple ways to price carbon

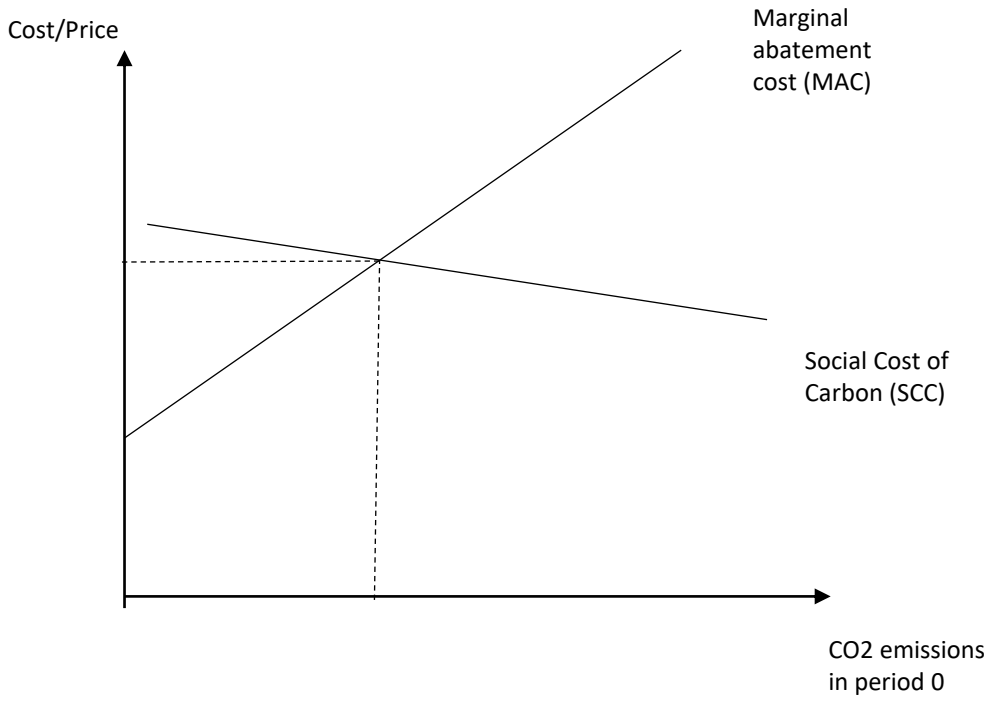
- Carbon prices provide market players with the necessary information to decide changes in investment, production, and consumption patterns, and to foster research efforts towards reducing the cost of abatement
- Efficient carbon-price trajectories begin with a strong price signal in the present and a credible commitment to maintain prices high enough in the future to deliver the required changes
- **Credibility** (i.e. the ability to stick to rules in trying situations), **transparency** (i.e. the predictability of outcomes in a given situation with a good knowledge of decision-making factors) and the **ability to learn from the past** in adjusting policy implementation are critical

Carbon tax	▪ Direct pricing and financial incentive ▪ High certainty for price; low certainty for level
Cap & Trade	▪ Most flexible, cost-efficient way to reach targets ▪ Low certainty for prices; high certainty for level
Crediting Mechanism	▪ Credits given to projects reducing emissions ▪ Requires 3rd party certification
Results-Based Climate Finance	▪ Funds given for reaching emissions goals ▪ Requires 3rd party certification
Shadow Prices	▪ Determine hypothetical cost of carbon ▪ Use cost in project valuation
Internal Carbon Fee	▪ Fee voluntarily charged to BU for emissions ▪ Proceeds used to finance greener assets

Source: Carbon Pricing Leadership Coalition, https://www.carbonpricingleadership.org/what

The social cost of carbon

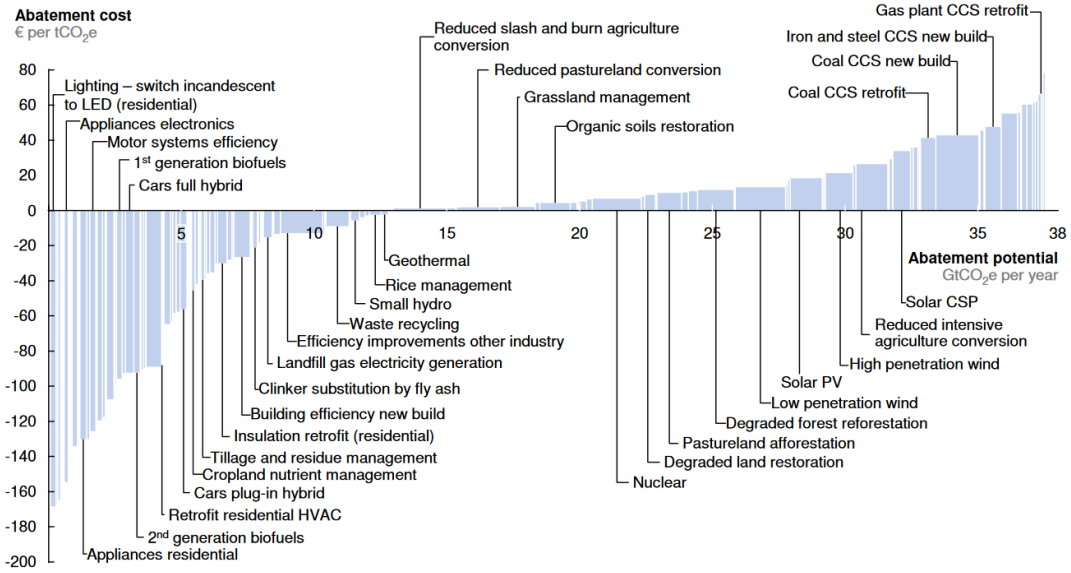
- From an economic standpoint the social cost of carbon is the price that encompasses all positive and negative externalities linked to carbon emissions
- Formally, the social cost of carbon is the difference between the net present values of the cost of abatement and the cost of damages
- This is a **cost-benefit analysis** that leads to a price of carbon that equates the marginal cost of an additional ton of CO2 emissions and the marginal cost of its abatement
- This method requires to be able to assess the marginal cost of damages which is very sensible to hypothesis about the discounting rate and about the link between temperature increases and actual damages; the SCC requires a view on emissions trajectories
- This is not a static analysis and the dynamic of the SCC curve (rising over time) and MAC curve (lowering over time with learning) need to be complemented with assumptions about technical progress and adjustments in targets
- The role of uncertainty is primordial



Source: Nicholas Stern, Stern Review : The economics of climate change, 2006, 662 pages

Abatement curve

- Addressing the MAC curve requires a methodology that is robust and allows for a cost-benefit appreciation
- Building the abatement curve requires to **look individually at all technological options** that are available (currently or potentially) and assess their implied cost per ton of CO2 emissions that are avoided
- Some of these options are actually beneficial, e.g. switching to LEDs for lighting allows for significant power savings that more than offset the cost
- Other options are deeply expensive and hard to deploy (deep decarbonation) although they may present benefits
- Ranking options in this way allows governments and companies to allocate resources in an efficient manner, prioritising efforts on the most impactful, least costly options
- This methodology is however quite sensitive to assumptions about the availability and cost of technologies (CCS most notably) and may lead to delays in implementing the most difficult, yet most impactful measures; carbon price variations should also be factored in

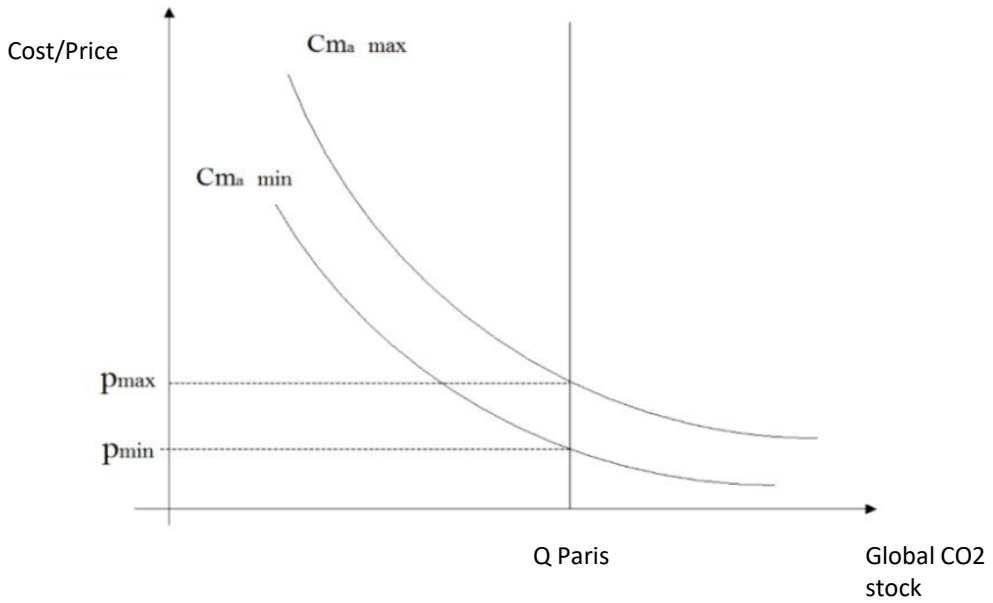


Note: The curve presents an estimate of the maximum potential of all technical GHG abatement measures below €80 per tCO_2e if each lever was pursued aggressively. It is not a forecast of what role different abatement measures and technologies will play.
Source: Global GHG Abatement Cost Curve v2.1

Source: McKinsey & Company (2010). Impact of the financial crisis on carbon economics. Version 2.1 of the Global Greenhouse Gas Abatement Cost Curve. London: McKinsey & Company. | Vogt-Schilb, When starting with the most expensive option makes sense: Optimal timing, cost and sectoral allocation of abatement investment, Journal of Environmnental Economics and Management, 2018, 24 pages.

The shadow price of carbon

- Instead of trying to define SCC curves that depend on emissions trajectories and imply subjective choices, the analysis starts with political objectives that are set and runs a **cost-efficiency analysis** to reach the target
- The optimal price for carbon is then a function of the political objective and of the technological assumptions behind the MAC curve
- The approach is subject to same difficulties surrounding uncertainty
- In the end, if the political objective is set at the socially optimal level, both approaches should yield the same result for carbon prices



Source: Rapport Quinet 2019

A refresher on discounting

- In Finance discount rates are used to reflect the effects of time over the value of a stream of cash-flows
- The basic assumption is that because of uncertainty there is a preference for the present and that future cash flows have less value than current ones
- The discount rate is then calculated using the **weighted average cost of capital** (WACC) that reflects the different levels of risk aversion of the equity and debt providers for any specific investment

$$WACC = Cost\ of\ Debt * \frac{D}{D+E} + Cost\ of\ Equity * \frac{E}{D+E}$$

With :

$$Cost\ of\ Debt = \left(r_f + r_{country} + r_{company}\right) * (1 - IS)$$

$$Cost\ of\ Equity = r_f + r_{country} + \beta(r_{market} - r_f)$$

$$NPV = \sum_{i}^{n} \frac{CF_i}{(1+WACC)^i}$$

Source: Rapport Quinet 2019

A few ethical considerations about intergenerational justice

- Most of the financial / economic analysis apparatus is based on **welfare, utilitarian vision of ethics** (Bentham) in which individuals maximise their utility by consuming
- This consequentialist vision of ethics is impersonal and assumes an equal value for the consumption of each individual, independently from circumstances and time
- In this context, the socially optimal choice is the one that improves the outcome of an individual without degrading that of others (Rawls) in a form of Pareto-optimum
- There is no conception of right or wrong and in the face of a catastrophic risk and uncertainty all generations are considered on an equal footing (i.e. the "pure rate of time preference" should be 0, only the risk of extinction should be valued) (Ramsey, 1928)
- This can (and has) been heavily challenged, especially because of the inequality of the consequences of climate change, affecting the poorest segments of current generations who should bear the greatest effort in favor of future generations
- This is also not in line with market rates

$$r = s = \delta + \eta g$$

where

r = the market interest rate;
s = social rate of time preference (which is the rate for discounting public projects);
δ (delta) = the 'utility discount rate';
η (eta) = the 'elasticity of marginal utility' with respect to consumption; and
g = the expected future growth rate of consumption.

$$Delta = pure\ time\ preference + risk\ of\ extinction$$

$$Eta = f(risk\ aversion; aversion\ to\ inequality;\ aversion\ to\ inequality\ through\ time)$$

Source: Beckerman et al., Ethics of the Discount Rate in the Stern Review on the Economics of Climate Change, World Economics, Vol. 8, N.1, 2007, 25 pages

Discrepancies in carbon pricing are affecting price signals

- The coexistence of multiple methods to approach carbon pricing induces various outputs (different inputs, different models, different outputs), leading to **high levels of uncertainty** around the actual value of carbon
- Adopting a high carbon value for internal carbon pricing is biasing the playing field in disfavour of ambitious actors
- Once an internal carbon price has been adopted, comes the question of its perennity and its actual use in decision making
- No simple answer to this

	Boiteux (2001)	Quinet 1 (2009)	Quinet 2 (2019)
2010	32	32	
2020	43	56	69
2030	58	100	250
2050	104	250	775
Growth rate	2.9%	4.9%	8.0%

Table: Social cost of carbon (in 2018 euros per metric ton of CO2) recommended in France by three different commissions. Source: France Stratégie.

Source: Christian Gollier, Du sang, des larmes et de la sueur : Les coûts de la transition énergétique, Collège de France, 2021

Quantitative perspective on price discrepancies

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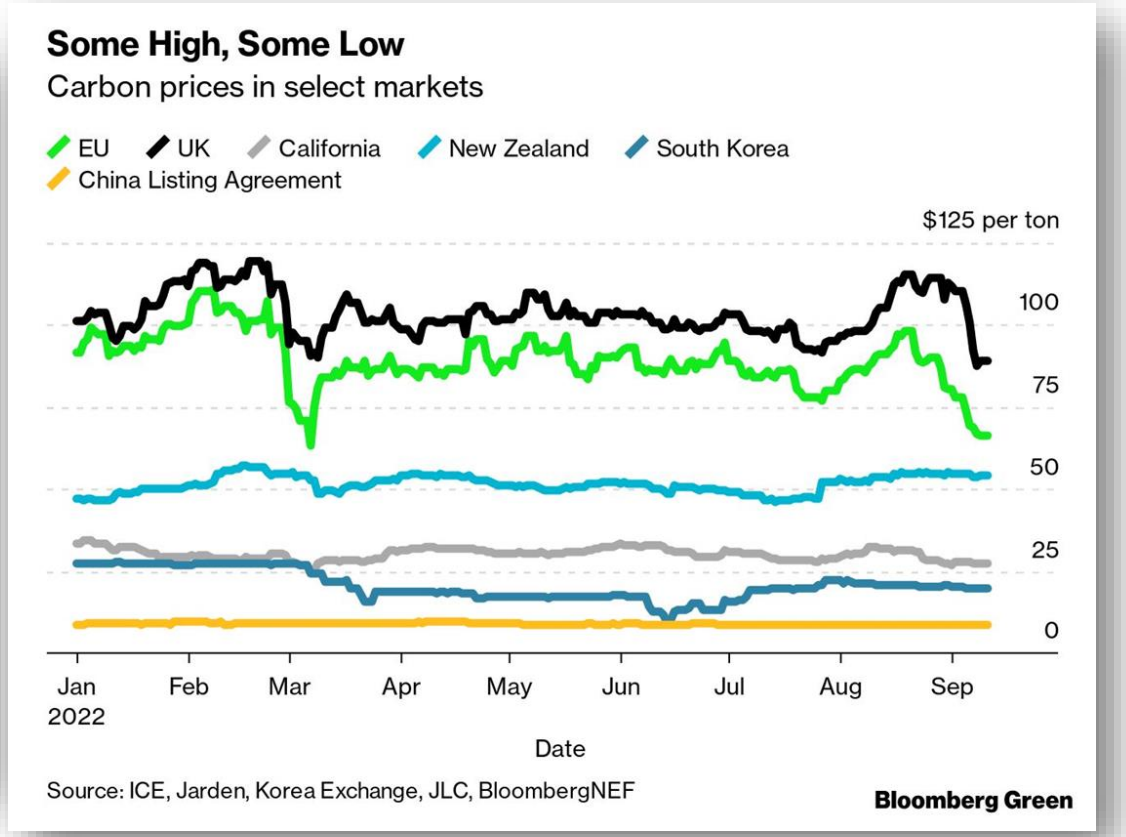
Varying Prices, Varying Impact

Internal carbon prices by type, impact of prices, and companies reporting each type

	Average internal carbon price ($/ton)	Price impact on business	Companies reporting
Implicit	61	2.5	107
Shadow price	50	1.5	502
Internal fee	41	5.5	84
Hybrid	39	2.0	57
Internal trading	23	4.5	9
Offsets	19	1.0	57

Sources: BloombergNEF, CDP
Note: for price impact, a higher number indicates greater impact.

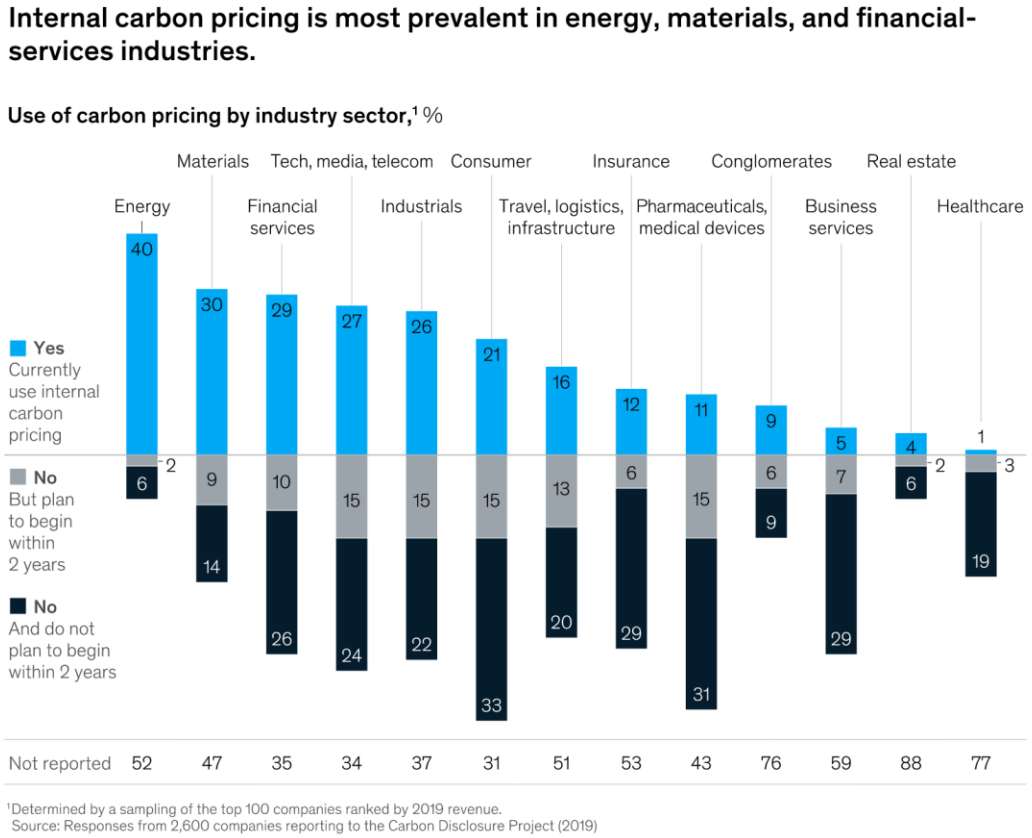
Bloomberg Green



Source: Nathaniel Bullard, Not every carbon price actually makes you pay, Bloomberg Green, Sparklines, 15/09/2022

Various adoption rates for internal carbon pricing

- Sectors such as healthcare, real estate and business services are late in the adoption of internal carbon pricing
- Sectors that are the most heavily faced with regulatory pressure and/or external carbon pricing are leading in adopting internal carbon pricing
- There are still high levels of reluctance from some actors to adopt internal carbon pricing in the near future



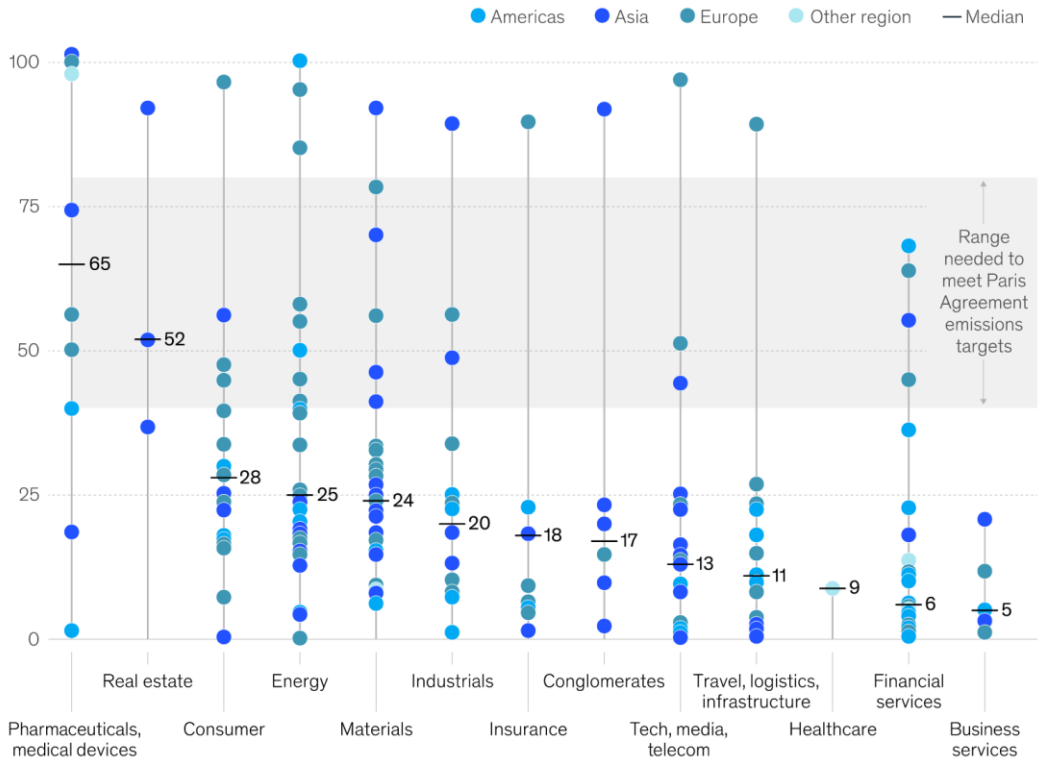
Source: https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/the-state-of-internal-carbon-pricing

ICP levels vary significantly across sectors and geographies

- The average level of carbon prices in 2019$ is around 25$, however there is a wide dispersion around this level
- In the same industry, x4 spreads can be observed between different actors, even accounting for geography
- Most of the ICPs are below the range needed to meet Paris Agreement emissions targets

The internal pricing of carbon emissions varies within and between industries and regions.

Distribution of internal carbon prices in 2019, $

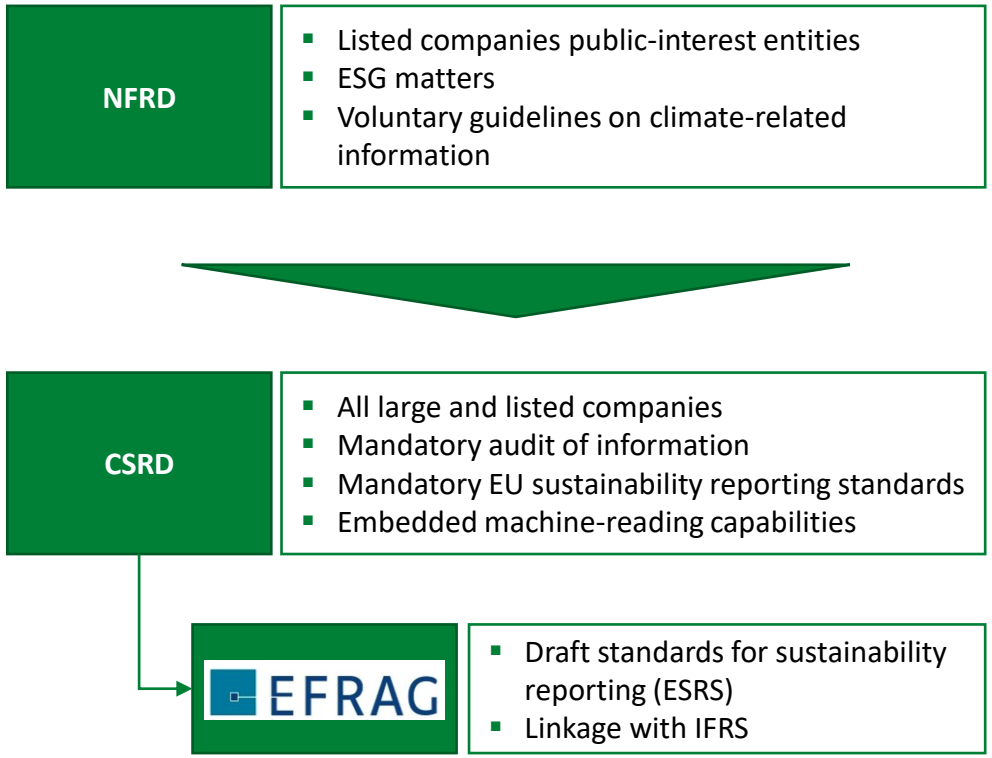


Source: https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/the-state-of-internal-carbon-pricing

Providing the necessary information to the market for collectively rational decision-making

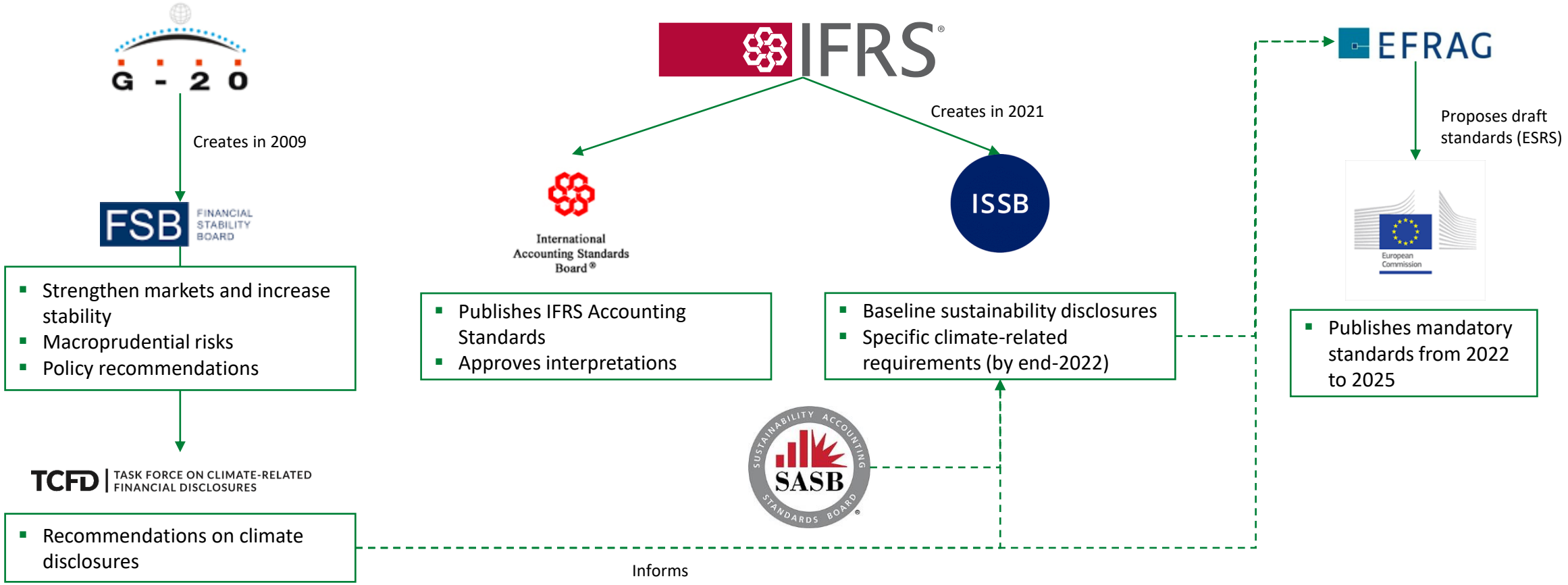
Climate reporting regulations are evolving fast

- Beyond carbon prices, extra-financial reporting has quickly developed as a way to provide investors and markets with the means to assess the environmental impact of their investments
- There are a significant amount of international, European and national reporting standards that are non-compatible, discretionary and/or imprecise leading to very low comparability both between assets and over time
- In 2014 the EU adopted the **Non-Financial Reporting Directive** (NFRD) and is now proposing a **Corporate Sustainability Reporting Directive** (CSRD)
- CSRD comprises an initiative on EU sustainability reporting standards. The EU Commission tasked the **European Financial Reporting Advisory Group** (EFRAG) with the task of drafting sustainability reporting standards that are bound to become mandatory



Source: World Bank, Climate toolkits for infrastructure PPPs, 2022, 384 pages

A complex regulatory ecosystem



Source: World Bank, Climate toolkits for infrastructure PPPs, 2022, 384 pages

The double materiality question

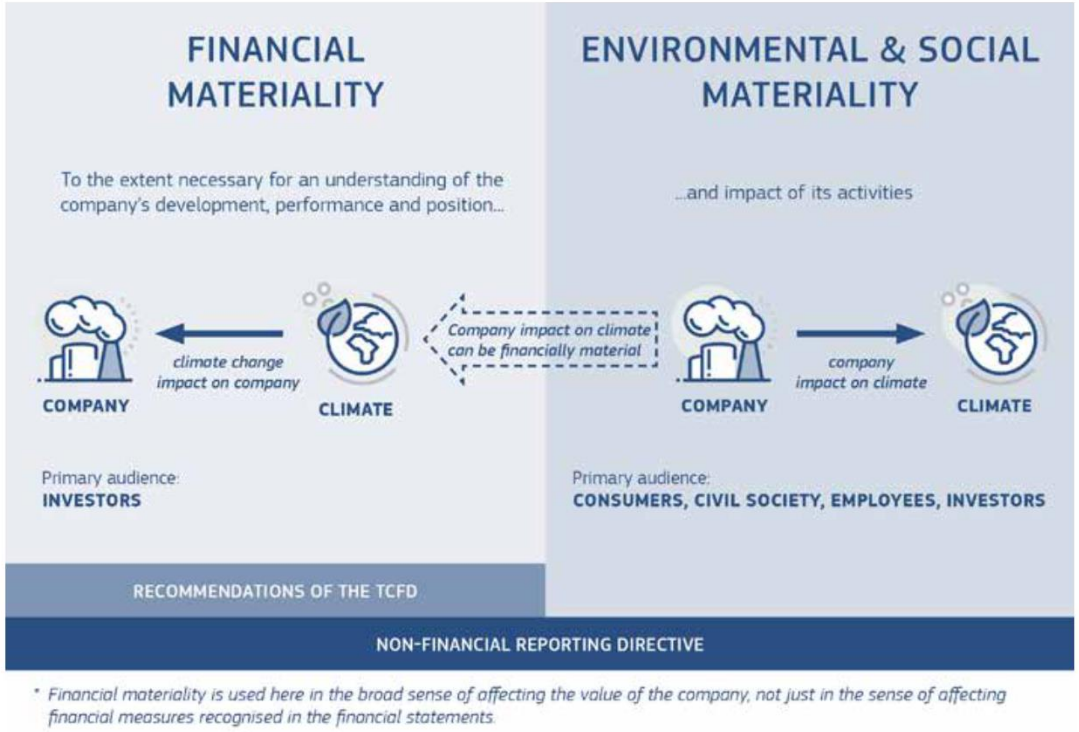
- The NFRD and CSRD introduce a double materiality reporting obligation (both and independently)

Impact materiality

- “Impact materiality is a characteristic of a sustainability topic or information in relation to an undertaking, in a particular sector or in all sectors. A sustainability topic or information is material from an impact perspective if the undertaking is connected to actual or potential significant impacts on people or the environment and is related to the sustainability topic over the short, medium or long term.”

Financial materiality

- “Financial materiality in the context of sustainability reporting is a characteristic of a sustainability topic or information in relation to an undertaking, a particular sector or all sectors. A sustainability topic is material from a financial perspective if it triggers financial effects on undertakings, i.e. generates risks or opportunities that influence or are likely to influence the future cash flows and therefore the enterprise value of the undertaking in the short, medium or long term but are not captured by financial reporting at the reporting date. These risks and opportunities may derive from past events or future events and may have effects on future cash flows in relation (i) to assets and liabilities already recognised in financial reporting or that may be recognised as a result of future events or (ii) to factors of enterprise value creation that do not meet the accounting definition of assets (liabilities) and/or the related recognition criteria but contribute to the creation/maintenance of enterprise value. The latter are generally defined as « capitals » in frameworks promoting a multi-capital approach.”

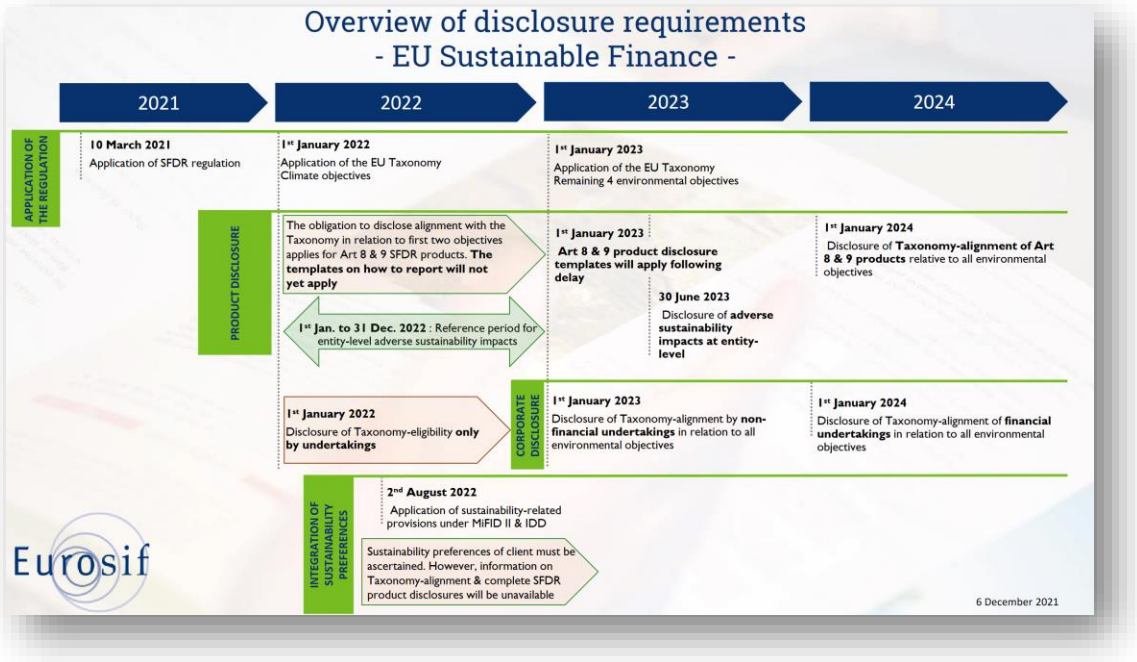


* *Financial materiality is used here in the broad sense of affecting the value of the company, not just in the sense of affecting financial measures recognised in the financial statements.*

Sources: https://finance.ec.europa.eu/system/files/2019-06/190618-climate-related-information-reporting-guidelines-overview_en.pdf | https://www.efrag.org/Assets/Download?assetUrl=/sites/webpublishing/SiteAssets/Appendix%202.6%20-%20WP%20on%20draft%20ESRG%201.pdf&AspxAutoDetectCookieSupport=1

Sustainability-related disclosure in the financial services sector

- Manufacturers of financial products and financial advisors have special duties towards their clients (fiduciary duty) and taking climate-change into account is part of this duty
- As part of the Action Plan on Financing Sustainable Growth, the EU adopted the **Sustainable Finance Disclosure Regulation** (SFDR) detailing the obligations of the industry towards its clients
- Disclosure obligations as regards **adverse impacts on sustainability** matters at **entity** and **financial products levels**
- SFDR introduces new categories:
- "**Article 6**" investments are those that do not follow any sustainable strategy and whose assets are not by themselves labelled as sustainable
- "**Article 8**" investments are those taking into account, among other factors, ESG criteria for investment decisions
- "**Article 9**" investments specifically target sustainable assets and has sustainability as its objective (with a reference benchmark)



Source: https://www.eurosif.org/news/infographic-on-sustainable-finance-disclosure-requirements/

The labelling race

- The main question for investment professionals then becomes: what is a sustainable investment?
- **Excluding approach:** remove certain industries from the investment universe (not possible for index funds!) such as coal, oil, weapons, tobacco… Becomes very difficult for structured products
- **Labelling approach:** have an independent third party assess the ESG position of a company / asset according to pre-established scoring systems :
  - The International Development Finance Club Green Finance Mapping (LuxFlag Climate Finance),
  - The FTSE Environmental Markets Classification System,
  - The HSBC Climate Change Structure (LuxFLAG Environment),
  - The International Capital Market Association's Climate Bonds Initiative (French Greenfin and Nordic Swan)
- This requires a **common language** and definition of what ESG is and how it should be appreciated (time-consistent methodologies, internationally accepted standards…)

		Number of funds		AuM in €bn (Morningstar and LuxFLAG data)		Number of funds with multiple labels
		12/31/2019	Growth in 9 months	12/31/2019	Growth in 9 months	12/31/2019
ESG	SRI Label (France)	321	↗ + 121	137.8	↗ x 2.7	66
ESG	FNG-Siegel (Germany, Austria & Switzerland)	101	↗ + 36	30.2	↗ x 3.1	56
ESG	LuxFLAG ESG (Luxembourg)	100	↗ + 55	42.9	↗ x 3.4	25
ESG	Towards Sustainability[1] (Belgium)	265	–	138.6	–	78
ESG	Umweltzeichen[1] (Austria)	116	↗ + 12	14.8	↗ x 1.3	41
"Green" labels	Nordic Swan Ecolabel (Nordic Countries)	32	↗ + 9	11.4	↗ x 1.4	6
"Green" labels	LuxFLAG Environment (Luxembourg)	10	↗ + 3	7.9	↗ x 1.3	6
"Green" labels	LuxFLAG Climate Finance[1] [2] (Luxembourg)	2	↘ - 1	0.05	↘ x 0.2	–
"Green" labels	Greenfin Label[1] (France)	19	↗ + 8	6.1	↗ x 2.3	8
TOTAL		806	↗ + 392	302	↗ x 3.2	126

Source: Novethic

Source: https://www.la-francaise.com/fileadmin/docs/Actualites/EN/2020/SustainableInvestingPanoramaOfSRILabels20201009.pdf

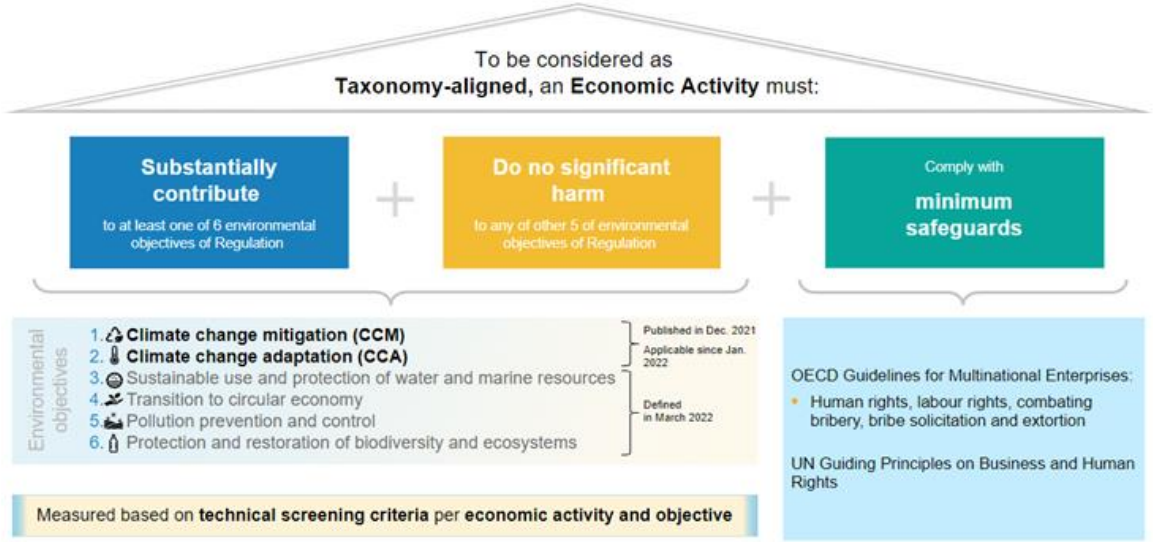
ESG ratings agencies

- In order to reduce the asymmetry of information and to emulate what is already done on debt markets, companies and investors turn ESG rating agencies that apply unified scoring systems
- Very similar to labelling and presents the same weaknesses, except that it is often pushed by established actors
- This a **data-driven business**, by which rating agencies turn qualitative and quantitative reporting and information into purely quantitative information (through the use of analysts and algorithms) in order to feed decision-making models

- ESG evaluation methodologies are often difficult to explain and justify: for example Tesla has been removed from the S&P 500 ESG Index and ExxonMobil was added

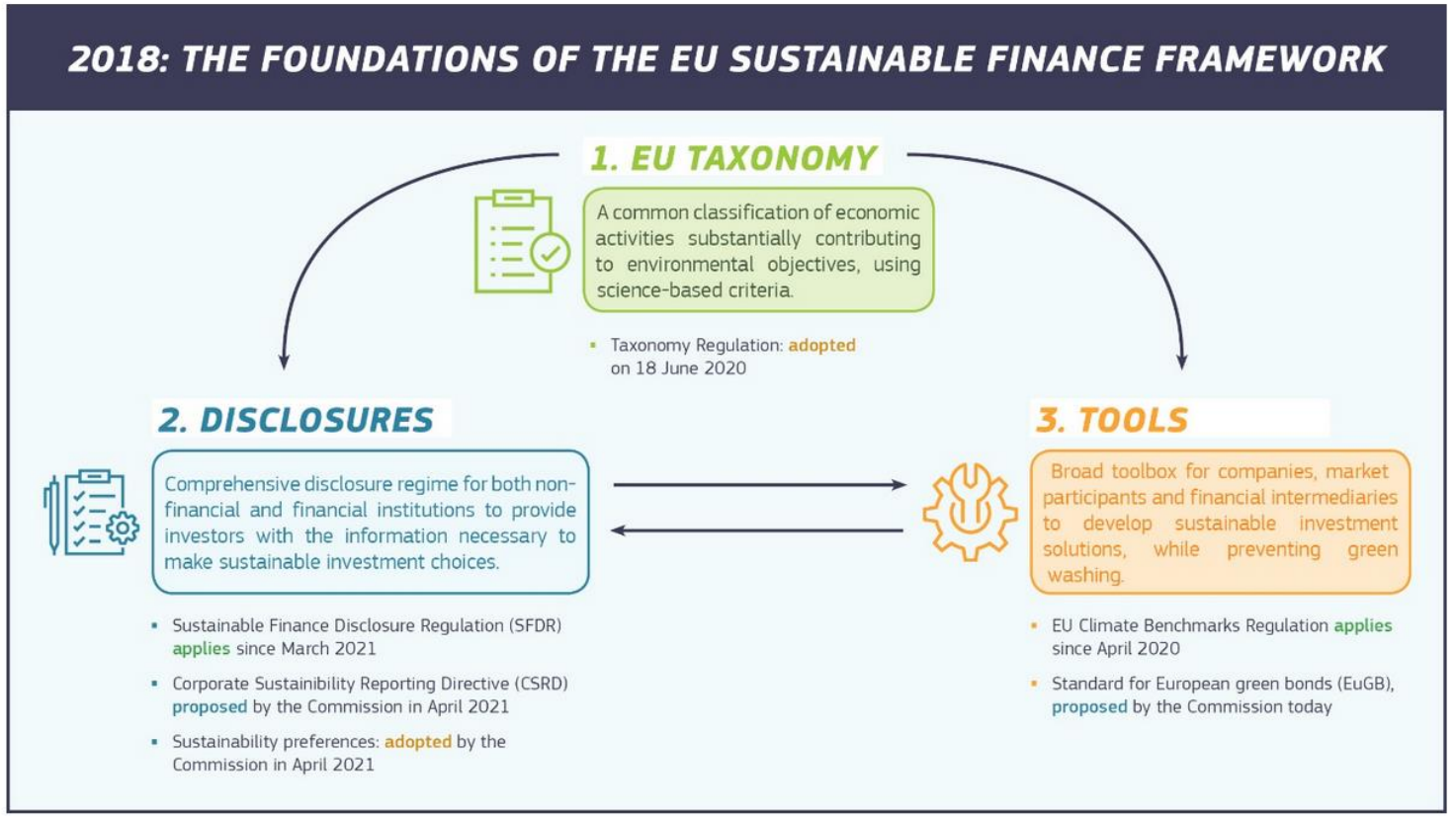
A focus on the European taxonomy

- As part of the European action plan on financing sustainable growth, the Commission decided to introduce an official taxonomy for discriminating between green and other investments
- The idea is to mark green investments in order for them to benefit from **better market conditions** and **easier financing** conditions due to lower risk (physical & transition) and higher demand
- The technical regulations following the adoption in 2020 of the taxonomy have led to very bitter discussions between Member States over the inclusion or exclusion of **gas and nuclear** as green investments
  - They are included as transitional activities contributing to climate change mitigation
- The **Platform on Sustainable Finance** will help the Commission further adjust the taxonomy
- It is not yet clear whether markets will use the European taxonomy as the main reference point or other more stringent taxonomies, however, the taxonomy is widely reused in other European regulations



Source: https://blogs.sap.com/2022/07/01/sap-papm-eu-taxonomy-management/ | European Commission

The European framework on sustainable finance is now well under deployment



Source: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52021DC0390&from=BG

Companies have to generate reliable climate information

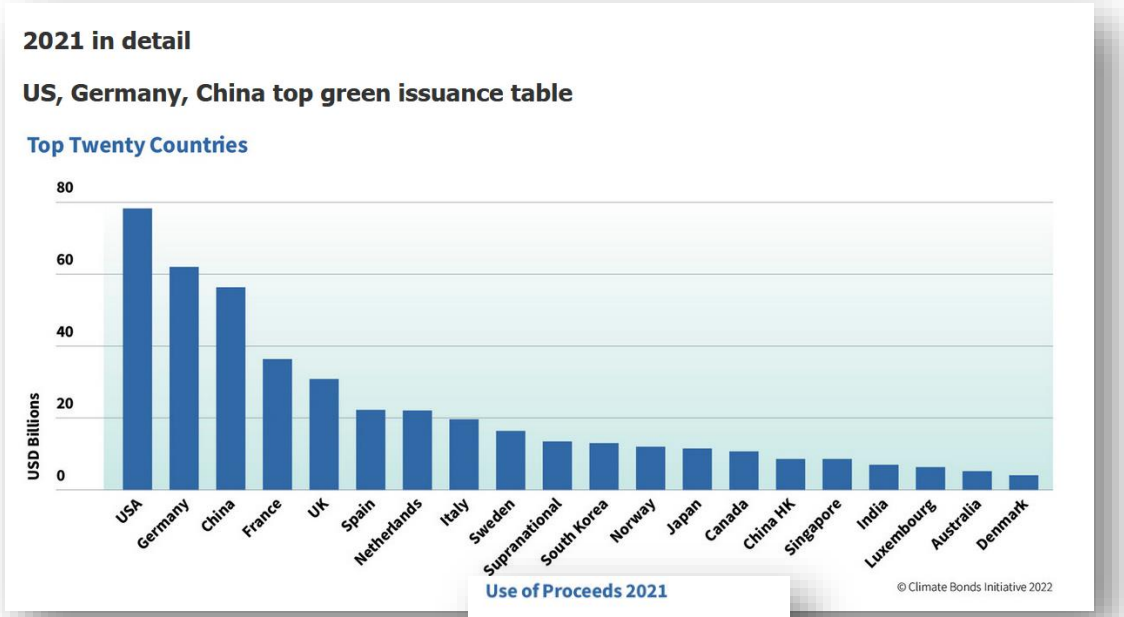
- The flipside of the increased attention on sustainability reporting is that companies have to organise in order to produce reliable extra-financial information
- Internal reporting systems are set up to track financial information through ERP softwares but not to follow environmental information
- Often requires significant investments in IT and organisational adjustments in order to have operations exchange information with finance teams (and investors relations)
- The question of the **liability of the company** should it fail to disclose materially significant information on the ESG side of things is an open-ended one
- **ESG reporting is a significant organisational challenge**

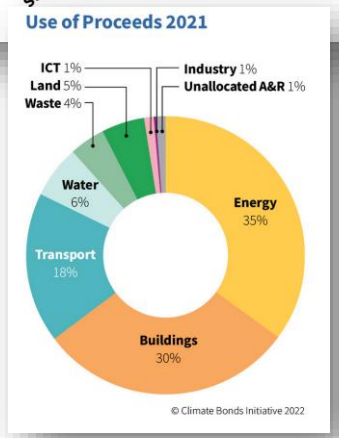
Establish Metrics	▪ Using ESG reporting standards like SASB ▪ Discriminate for industry-specific metrics
Set Targets	▪ Take stock of existing initiatives ▪ Review the performance of peers ▪ Discuss with operational teams ▪ Engage with stakeholders and value chain
Organise monitoring and reporting	▪ Invest in monitoring equipment (+training) ▪ Organise reporting chain to guarantee reliability and exhaustivity of information ▪ Organise periodic internal and external control
Report	▪ Integrate ESG reporting in the financial reporting schedule ▪ Organise Board-level information and validation ▪ Produce narrative around ESG and financial information ▪ Marketing and communication ▪ Analyse usage and feedback to integrate into next reporting round

Building new financial instruments: a focus on Green Bonds

Green Bonds: definition and market

- A **Green Bond** is a debt instrument whose proceeds are exclusively affected to the financing of environmentally compatible projects
- This runs contrary to the basic principle of **fungibility of cash** within the financial management of a company (i.e. cash-at-hand can pay for any investment or expense)
- Green Bonds are supposed to offer cheaper forms of financing for environmental projects, at the expense of a reduced flexibility in the financial management of a company
- The market for Green Bonds reached nearly $500bn in 2021, on a steep acceleration





Source: *https://www.climatebonds.net/2022/01/500bn-green-issuance-2021-social-and-sustainable-acceleration-annual-green-1tn-sight-market*

Standard characteristics

- Green Bonds are similar to any other obligation with a principal amount, coupon payments and a maturity date
- They rank pari passu with other debt vehicles and do not benefit from any seniority
- They may sometimes benefit from tax incentives reducing their cost for the emitter
- Green Bonds have co-benefits:
  - Exposure for projects / assets
  - Marketing, reputational effect
  - Access to liquidity pockets for financing
- The issuer should explain in the documentation how it will track the use of proceeds and has to set up an internal process to do so (or use sub-portfolios)
- It is recommended to detail which short-term financial instruments the proceeds will be invested in while waiting for formal investment
- Reporting obligations have to be detailed in the contract and external assurance should be given to investors (rating agency, auditor, 3rd party reviews and certifications)

Type	Proceeds raised by bond sale are	Debt recourse	Example
"Use of Proceeds" Bond	Earmarked for green projects	Recourse to the issuer: same credit rating applies as issuer's other bonds	EIB "Climate Awareness Bond" (backed by EIB); Barclays Green Bond
"Use of Proceeds" Revenue Bond or ABS	Earmarked for or refinances green projects	Revenue streams from the issuers though fees, taxes etc are collateral for the debt	Hawaii State (backed by fee on electricity bills of the state utilities)
Project Bond	Ring-fenced for the specific underlying green project(s)	Recourse is only to the project's assets and balance sheet	Invenergy Wind Farm (backed by Invenergy Campo Palomas wind farm)
Securitisation (ABS) Bond	Refinance portfolios of green projects or proceeds are earmarked for green projects	Recourse is to a group of projects that have been grouped together (e.g. solar leases or green mortgages)	Tesla Energy (backed by residential solar leases); Obvion (backed by green mortgages)
Covered Bond	Earmarked for eligible projects included in the covered pool	Recourse to the issuer and, if the issuer is unable to repay the bond, to the covered pool	Berlin Hyp green Pfandbrief; Sparebank 1 Bolligkredit green covered bond
Loan	Earmarked for eligible projects or secured on eligible assets	Full recourse to the borrower(s) in the case of unsecured loans. Recourse to the collateral in the case of secured loans, but may also feature limited recourse to the borrower(s).	MEP Werke, Ivanhoe Cambridge and Natixis Assurances (DUO), OVG
Other debt instruments	Earmarked for eligible projects		Convertible Bonds or Notes, Schuldschein, Commercial Paper, Sukuk, Debentures

Source: https://www.climatebonds.net/market/explaining-green-bonds | https://www.nortonrosefulbright.com/en/knowledge/publications/2df0ab1d/green-bonds

The European Green Bond Standard

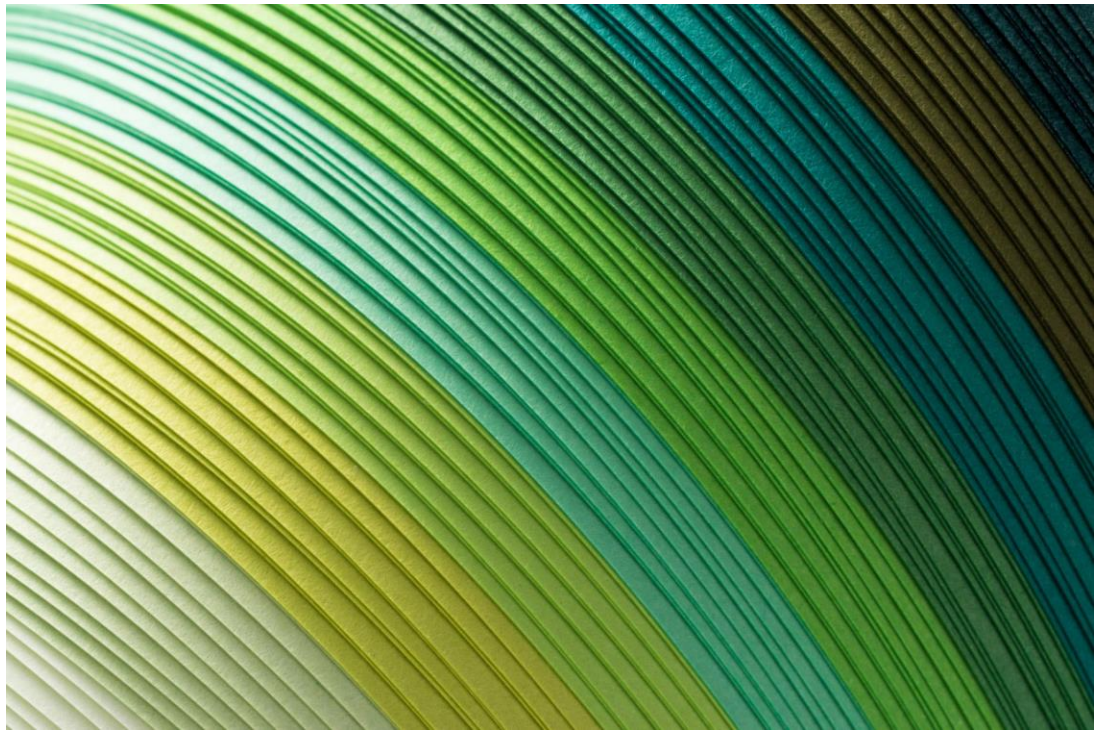
- Always as a part of the 2018 Action Plan on financing sustainable growth, the EU Commission has proposed a European Green Bond Standard
- The idea is to reduce heterogeneity in market practices and to reduce the burden in assessing what a "green" investment should be (lack of reliable, comparable and verified information)
- It is a voluntary standard that will be in competition with other standards that pre-exist (esp. Green Bond Principles from the International Capital Markets Association)
- It is based on the work of the Technical Experts Group on Sustainable Finance and it is still waiting for approval by the Council and Parliament
- The Standard ("EuGB" or "European Green Bond") could be used inside and outside of the EU, as long as the requirements are met

Taxonomy alignment	▪ The funds raised by the bond should be allocated fully to projects that are aligned with the EU taxonomy
Transparency	▪ Full transparency on how the bond proceeds are allocated through detailed reporting requirements
External review	▪ All European green bonds must be checked by an external reviewer to ensure compliance with the Regulation and taxonomy alignment of the funded projects
Supervision of reviewers	▪ External reviewers providing services to issuers of European green bonds must be registered with and supervised by the ESMA. This will ensure the quality of their services and the reliability of their reviews to protect investors and ensure market integrity

Source: https://finance.ec.europa.eu/sustainable-finance/tools-and-standards/european-green-bond-standard_en

Greenium?

- The **Greenium** is the difference in return between a green security and a standard security with identical risk profile (for example two municipal bonds from the same emitter with the same maturity profile)
- It represents the wealth investors are ready to give up in order to contribute to ESG efforts and is an important metric of the value the market is giving to ESG efforts as it provides an implicit price; a high level of greenium would also mean that markets price climate change risk
- Studies (empirical and statistical) vary significantly when assessing the value of the greenium and no definitive conclusion seems to emerge
- One explaining factor is that the greenium is affected by the reporting transparency of the issuer and by greenwashing practices



Sources: Loads of studies too long to summarize here, ask me if you have any question.