

LIFEGUARD WANTED

Tracking Art. 2.1c &
transition risks
in financial markets



This report summarizes the ideas of the Corsica Seminar working group on “Regulatory monitoring of 2°C alignment and climate-related financial risk in financial markets” consisting of

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Participation in the working group does not constitute an endorsement by the individual or the organisation of the contents therein. The results represent the collective conclusions of the working group members and are thus a compromise across participant views

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The Energy Transition Risk project



The ET Risk consortium, funded by the European Commission, is working to develop the key analytical building blocks needed for Energy Transition risk assessment and bring them to market over the coming two years.

1. TRANSITION SCENARIOS

The consortium will develop and publicly release two transition risk scenarios, the first representing a 'soft' transition extending current and planned policies and technological trends (e.g. an IEA NPS trajectory), and the second representing an ambitious scenario that expands on the data from the IEA 450S /2DS, the project's asset level data work, and relevant third-party literature. The project will also explore more accelerated decarbonization scenarios.

2. COMPANY & FINANCIAL DATA

Oxford Smith School and 2° Investing Initiative will jointly consolidate and analyze asset level information across six energy-relevant sectors (power, automotive, steel, cement, aircraft, shipping), including an assessment of committed emissions and the ability to potentially 'unlock' such emissions (e.g. reducing load factors).

3. VALUATION AND RISK MODELS

- a) **2°C portfolio assessment** – 2° Investing Initiative. 2° Investing Initiative will seek to integrate the project results into their 2°C alignment model and portfolio tool and analytics developed as part of the SEI metrics project.
- b) **ClimateXcellence Model** – The CO-Firm. This company risk model comprises detailed modeling steps to assess how risk factors impact margins and capital expenditure viability at the company level.
- c) **Valuation models** – Kepler Cheuvreux. The above impact on climate- and energy-related changes to company margins and cash flows can be used to feed discounted cash flow and other valuation models of financial analysts. Kepler Cheuvreux will pilot this application as part of their equity research.
- d) **Credit risk rating models** – S&P Global. The results of the project will be used by S&P Global to determine if there is a material impact on a company's creditworthiness. S&P Dow Jones Indices, a S&P Global Division, will explore the potential for developing indices integrating transition risk.

I. INTRODUCTION

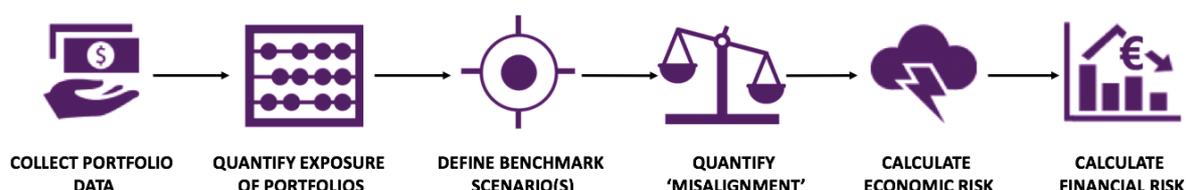
Options around the supervision of financial institutions' climate goal alignment and associated financial risk is on the agenda of both climate and financial policymakers and supervisory authorities. This type of supervision can speak to two related objectives:

- The Paris Agreement Art. 2.1(c) creates a political mandate to align financial flows with climate goals, creating an associated **reporting requirement for climate policymakers**. The Swiss government is considering integrating Art. 2.1(c) into its UNFCCC reporting. Such monitoring can create transparency around progress vis-à-vis the Paris Agreement and inform potential associated policy actions. It can also help climate policymakers identify economic upsides and downsides to economic trends as they materialize in financial markets.
- Continuous supervision by financial supervisory authorities can also ensure **early identification of potential climate-related market and systemic risk**. These types of exercises have started being explored in a few countries (e.g. Sweden, The Netherlands, Germany, United Kingdom), albeit largely ad-hoc as opposed to a continuous, comprehensive monitoring exercise.

This note provides a roadmap for financial regulators to supervise and monitor regulated entities' capital misallocation relative to climate goals / the Paris Agreement, and track associated potential financial risk. The note builds on insights from key experts from Finance Ministries, Financial Supervisory Authorities, Environment Ministries, Central Banks, and the private sector.

This paper is a technical paper targeting policymakers and regulators. It does not seek to make a political case for monitoring, but rather outlines how, in practice, the objective around monitoring, described above, can be implemented. Specifically, it identifies the following six steps, further outlined in the next section:

- 1) *Collect regulated entities portfolio data (i.e. ownership of financial assets)*
- 2) *Quantify asset and investment exposure of financial portfolios for key transition-related business segments*
- 3) *Define benchmark scenario (i.e. stress-test or climate transition scenario)*
- 4) *Calculate 'misalignment' / 'misallocation' relative to benchmark scenario*
- 5) *Calculate 'economic risk' associated with potential 'misallocation' (i.e. impact on economic asset valuation and potential company cash flows)*
- 6) *Calculate potential associated 'financial risk' (i.e. impact on financial asset valuation)*



A MONITORING ROADMAP FOR REGULATORS AND CLIMATE POLICYMAKERS

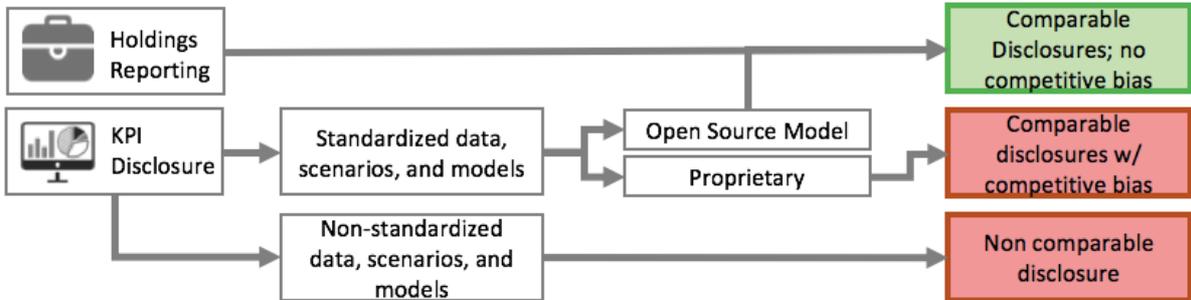
The following summarizes a potential technical roadmap for financial regulators and climate policymakers monitoring progress on Paris Agreement (Art. 2.1c) and associated potential financial transition risk.

1) Collect regulated entity portfolio data (i.e. ownership of financial assets)

The first step to supervision and monitoring is collecting financial portfolio data from financial institutions. Depending on the legal jurisdiction, this could be done in a number of different ways:

- **Data may already be available...**In some jurisdictions, certain regulated entities already have to make their portfolio data public (e.g. Sweden for public pension funds, United States for mutual fund managers and insurance companies). In addition, in some jurisdictions existing data collection from regulated entities by the supervisory authority may already suffice for taking the next steps (e.g. EU member states for insurance companies under Solvency II). In both of those cases, further data collection is not necessary, assuming the data is provided at sufficient level of granularity (i.e. security level).
- **Where this is not the case, or where available data does not suffice for desired analysis, the financial supervisory authority could circulate a data collection request** based on the portfolio data. These types of data requests have precedence and have been used as a first step for example by the Dutch Central Bank and California Insurance Commission. They also are traditional tools of stress-testing frameworks. One challenge is ensuring the data collection request is defined in a way that aligns with the modeling needs of the regulators.
- **...Alternatively, the regulator could ask for the results of the desired assessment directly – tailored on the approach targeted by the regulator.** This could be in the form of legislation related to public reporting (e.g. Art. 173 of the French Energy Transition Law) and / or direct reporting of assessments to regulators. To ensure comparability, this would require however the same model, data, and assumptions across all assessments by the investors. This approach is currently being considered by the Swiss government in engaging with pension funds by pre-defining the assessment framework. (NB: In choosing this approach, all the following steps are still required, but would be conducted however by the financial institution itself rather than by the regulator). The report “Trails for Climate Disclosure: A Regulatory Review” discusses the pros and cons of each of these approaches in further detail ([Link](#)).

Graphic: Pros and Cons of collecting portfolio holdings versus KPIs (i.e. assessment results)



2) **Quantify asset and investment profile of financial portfolios for key transition-related business segments**

Once the portfolio data has been collected, the second step is to calculate the asset and investment profile for key transition-related business segments (NB: This step is the same when attempting to track physical risk, albeit requiring a more holistic coverage of assets).

The calculation behind this step requires the following sub-steps:

- **Purchasing and collecting ‘raw’ asset and investment data for key transition sectors at physical asset level...** This exercise will likely cover at least fossil fuels (e.g. oil & gas, coal mining), electric power, and automotive manufacturing, and could also include materials, shipping, real estate, and aviation.¹ Total costs of the data for a single license in high priority sectors are estimated between EUR 40,000- EUR 60,000 p.a. at current prices, although prices are expected to drop as a result of taking advantage of economies of scale and a homogenization of the use case (e.g. consistent data pull demands across clients). Equally, data providers may charge different prices for clients with different sizes.
- **...mapping the data to companies...** This raw physical asset data can be mapped directly first to companies using standard accounting practices (e.g. based on the ownership share or management control of parent companies). This exercise can be done by the financial regulator or applied directly using third-party, open-source matching algorithms (e.g. OpenCorporates, those developed by the SEI Metrics consortium²). At this stage, there are some gaps in comprehensively matching this data. To our knowledge, the 2° Investing Initiative is the first organization to have attempted this exercise across a range of sectors.
- **...and financial assets...** Once data has been mapped to companies, it has to be mapped to financial assets. This requires identifying the financial assets associated with companies using financial cross-reference services (e.g. S&P Cross-Reference, Bloomberg). It also requires developing allocation rules for different types of financial assets. Such allocation can be predicated on different logics, including a financing impact, ownership, or simple portfolio weighting approaches.³ At this stage, the most common approach is the ‘ownership’ logic, which attempts to allocate exposure via financial stake (e.g. equity or debt positions). This is the approach currently being applied by many providers of the portfolio carbon footprinting and the 2°C assessment developed by the 2° Investing Initiative. From a risk perspective, in some cases the ‘portfolio allocation’ logic may provide further insights into the scale of the risk exposure. From a ‘climate goal’ aspect in turn (e.g. Paris Agreement Art. 2.1c), it makes sense to seek to apply an ‘impact’ focused approach (in line with climate policy concepts like ‘additionality’ of financing), although an ownership logic may also be relevant to understand the ownership structures behind assets and financing flows.
- **...Calculating asset and investment profile of each of the portfolios.** On the basis of this data, the ‘ownership’ or ‘exposure’ of each financial portfolio and regulated entity to transition-related assets and investments can be quantified. This involves a simple ‘exposure’ calculation for each financial portfolio. The results can then be expressed in economic units (e.g. current and planned installed electric capacity, current and planned fossil fuel production and reserves, current and planned automobile production, etc.) and form the basis of further analysis integrating scenario and financial data to inform capital misallocation and related risk models.

¹ See [Climate Disclosure: How to Make it Fly](#) and [“Stitching together best practice”](#) for further details on data.

² See a description of this research consortium [here](#).

³ An upcoming report by the SEI Metrics consortium will discuss these approaches in greater detail.

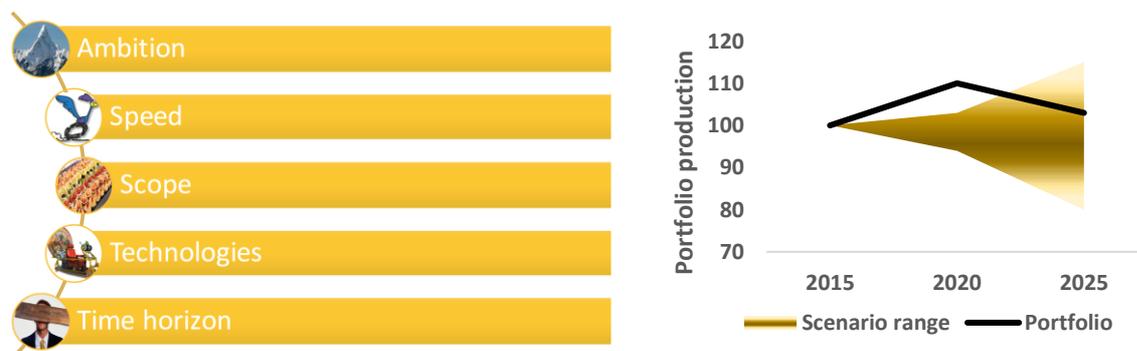
3) Define a benchmark scenario (i.e. stress-test or climate transition scenario)

The assessment of capital misallocation requires an economic scenario around production, assets, and investment profiles associated with different technologies and fuels. The most prominent scenarios are published annually by the International Energy Agency, although there are many available scenarios distinguished by their *ambition, speed, scope, technology beliefs, and time horizon*:

- **Ambition:** Scenarios are built with different levels of ambition related to the scale of the energy transition. Thus, the International Energy Agency publishes a '6°C' (Current Policy Scenario), a '4°C' (New Policy Scenario), and a '2°C' (450 Scenario), each associated with different outcomes related to total GHG emissions and the decarbonization curve. Other low-carbon scenarios are published as part of the IPCC or independent research (e.g. Greenpeace).
- **Speed:** Scenarios with similar absolute GHG emissions budgets may achieve these at significant different decarbonization rates. Thus, some scenarios have a more sudden transition in the short-term, but a smoother long-term curve, whereas other scenarios follow business as usual initially but then see abrupt changes in trajectory post-2030.
- **(Sector and geography) scope:** Some scenarios are limited to only certain countries or just the fossil fuel sector. They also provide different levels of granularity. For example, IEA scenarios tend to be detailed for the fossil fuel and power sector, but relatively vague for other sectors.
- **Technology beliefs:** Scenarios differ in their optimism/pessimism around different technologies. For instance, some scenarios decarbonize the power sector largely through nuclear and carbon capture and storage, while others rely more on renewables and storage.
- **Time horizon:** Finally, scenarios will also differ on their time horizon, with some scenarios going out to 2100 (linking to Art. 4 of the Paris Agreement⁴) while others go only 5 years.

Importantly, none of the existing suite of scenarios act as proper risk scenarios, which would require parameters related to prices, costs, and specific policy constraints for integration with risk and valuation models. Thus they require adding additional risk metrics to allow these scenarios to become useful. This is the objective of the EU-funded *Energy Transition Risk & Opportunity (ET Risk)* project.⁵

As pointed out by the FSB TCFD, there is unlikely to be a *right* scenario, and thus it likely makes sense to work across several scenarios rather limiting the analysis to one scenario (see example figure below). Yet policymakers may also seek to focus on an internationally agreed 'reference' scenario in the interest of comparability. Currently, this does not exist outside the widely used IEA scenarios. For any choice, the ability to have access to the scenario's underlying assumptions and parameters is key.



⁴ Related to balancing emissions and removals of greenhouse gas emissions in the second half of this century.

⁵ See project description [here](#).

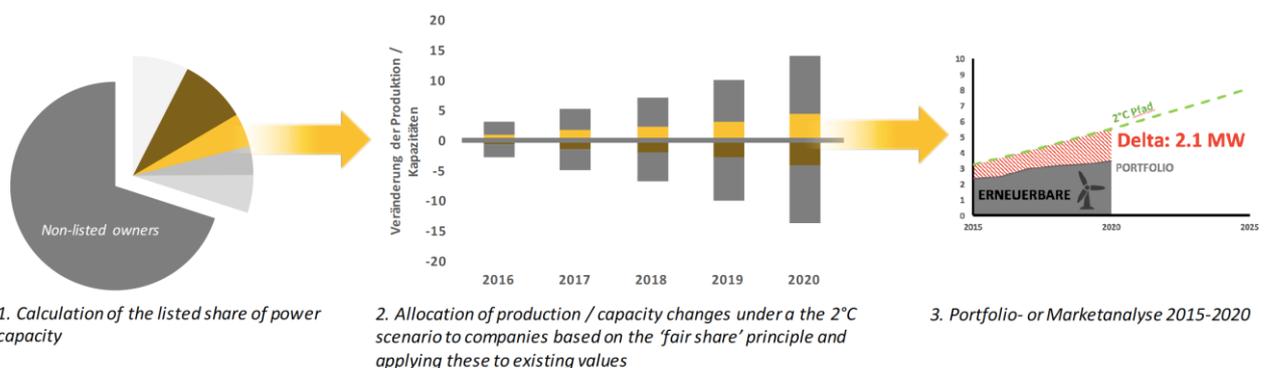
4) Calculate 'misalignment' / 'misallocation' relative to benchmark scenario

Steps 1 through 3 above provide the basic tools to assess capital misallocation relative to a scenario. Comparing portfolio trends to scenarios, however, requires several key modelling choices:

Exposure vs. trend: The benchmark scenarios inform both the slope of the decarbonization curve and the position on the curve at various points in time (e.g. 2020, 2025, 2030). The comparison with portfolio exposure could thus focus on either identifying the misalignment of the exposure at a point in time (e.g. 20% renewable share vs. 25%) or the trend (e.g. 10% increase in oil production in portfolio versus 1% increase in the market). The difference between the two indicators is that one only addresses the planned investment profile whereas the other also looks at the existing capital stock. From a portfolio managers' perspective, both may be interesting as the investment profile indicator can reveal those companies seeking to change their business model. On the other hand, from a risk perspective, an assessment of both existing assets and investment profile is likely to be more relevant.

Market vs. economy: The other modelling decision is whether to adjust the benchmark to asset classes. The simplest approach is to simply compare the economic scenario benchmark to the portfolio. This is likely to be misleading however, since one wouldn't necessarily expect the same exposure in a stock market as in the economy. For example, power capacity is at least partly owned by households and non-listed companies. It thus may make sense to calculate asset class specific benchmarks. One possible approach is to apply the asset class specific exposure starting point (e.g. in 2016) and apply the build out / decline rates from the scenario. This is the approach developed by the 2° Investing Initiative in defining 2°C listed equity and corporate bond benchmarks (Figure below). Another option is to also adjust the build out / decline rates based on assumptions around particular features of the asset class. There are a number of question marks around the potential assumptions that would inform such an adjustment, however.

Macro vs. micro. Another key modelling question is to what extent macro trends are expected to be reflected by micro-economic actors. This is particularly true for companies as one could imagine a utility that has 100% gas capacity and still be 2°C compatible and viable in the medium-term as its role is to provide power in load balancing modes. The easiest solution is to utilize a 'fair share' approach, essentially forcing all companies in a portfolio to hit the same exposure targets, though this approach does not account for specialized market actors. The challenge is particularly relevant for individual companies, but is less relevant for portfolio managers managing diversified portfolios across a range of companies due to diversification effects. In any case, these macro / micro elements suggest that the modelling exercise should consider both 'relative' exposures between technologies (leaving the targeted macro exposure open) and 'absolute' exposure compared to market benchmarks (quantifying a specific macro exposure), which will give different benchmark perspectives.



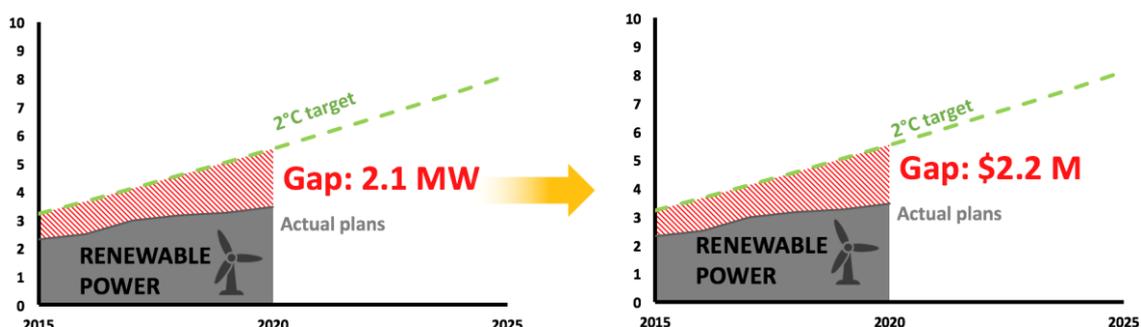
5) Calculate 'economic risk' associated with potential 'misallocation'

The basic exercise described above quantifies 'misalignment' of a portfolio's exposure with an economic transition scenario (NB: Its relevant to note that the modelling framework would likely be the same related to other economic trends e.g. demographic changes, robotization etc.). As outlined above, while a number of modelling decisions are required for the specific calculation, the basic framework is relatively straight-forward and consistent, involving the comparison of the portfolio's exposure with a transition scenario benchmark. Modelling questions then relate to potential adjustments to the economic benchmark by asset class and the exact decision on the indicator to be tracked (e.g. trend vs. exposure, economic units, etc.).

This exercise however by itself does not inform on 'economic risk', which requires calculating monetary impacts. Calculating the 'economic risk' (i.e. risk to companies in the real economy) requires converting misalignment indicators to their implications for physical asset valuation and / or company cash flows. This conversion requires both additional assumptions in the *scenario* around the relative development of prices and costs as well as assumptions around *company* positioning. The economic risk calculation specifically requires assumptions around the cost of production (including potential regulatory costs / incentives), the price of products / services sold (including potential potential taxes associated with these prices and who is required to pay them), and adaptive capacity of companies.

Calculating monetary impact may also suggest a need for a more accurate allocation of macroeconomic effects to microeconomic actors (see discussion above). There are three options around calculating such impact:

- **Fair share approach:** This approach uses a simple 'fair share' allocation rule where all sector-level production and capacity trends are proportionally distributed across companies based on market share. While relatively crude, it likely yields a low error at portfolio level and can easily be applied at very low cost to a large universe.
- **Cost approach:** This approach uses the cost structure of a company's existing, planned, and potential capital stock to estimate which assets meet a sector-wide output constraint under the assumption that low-cost assets will be deployed first. This logic has been applied by the Carbon Tracker Initiative for oil, gas, and coal production and capital expenditure (CTI 2014; 2016). This approach is intuitive and *relatively* easily applicable given asset-level data with associated production cost models (though production cost models can of course be debated). It is, however, likely limited to sectors with largely homogenous products (e.g. fossil fuels).⁶
- **Bottom-up company analysis:** This approach seeks to identify each company's individual positioning relative to macro trends, tracking assets, pricing power, market positioning, and other parameters. From a financial and economic risk perspective, it is the most appropriate and can be applied to all companies. The challenge of this approach is the cost of application.



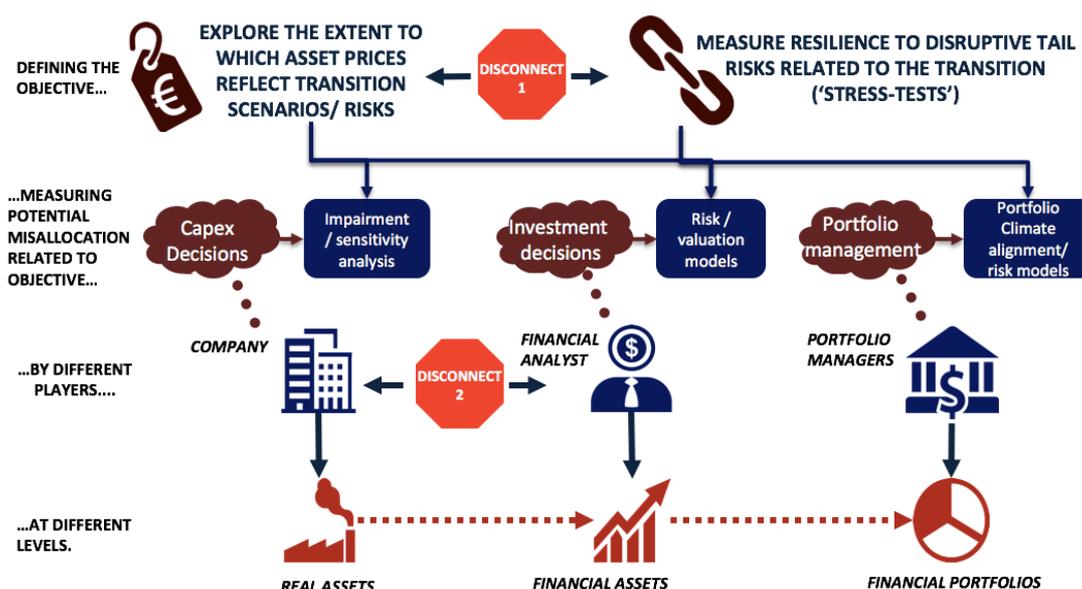
⁶ This is because production cost modelling is extremely difficult outside such sectors and thus is largely unavailable

6) Calculate potential associated 'financial risk' (i.e. impact on financial asset valuation)

The final step of a monitoring exercise from a financial regulator's perspective is translating potential economic risk into financial risk. While transition risks for companies in the real economy may lead to financial risk for investors and creditors, the pass-through is not likely to be one-to-one: Financial market actors may already – and indeed are expected to - price certain type of risks before they materialize. This is true whether or not the companies themselves have identified and mitigated such risk. High uncertainty on portfolio company earnings or creditworthiness may lead to higher risk premiums being placed on such companies (reflected in lower P/E ratios), or below BAU assumptions on future cash flows. If this has occurred, physical asset write-downs would not significantly change market prices, and indeed, markets might move well ahead of physical cash flows if they think a significant policy or technological breakthrough has been announced. Equally, market expectations of the transition may 'over-shoot' the actual effects of the transition in the real economy as a result of overly optimistic/pessimistic market expectations about future trends.

Assessing the extent to which these risks are priced requires integrating assumptions around economic risk into financial valuation and risk models. This is really just one additional step to the previous one with a view towards the cash flows associated with financial assets specifically. The results of this analysis can then be compared to actual asset prices to identify potential losses under various transition scenarios and related discount rate assumptions. Critical in this regard is matching the model with actual cash flow time horizons. This likely requires applying long-term assumptions around the long-term, cash flows currently extrapolated in existing models. The actual models that would underpin such an analysis likely require further development and may be need to extend beyond the framework of current practices (e.g. time horizon of analysis, etc.).

Finally, financial regulators will likely want to emphasize tail risks in these types of assessments, given their mandate around market and systemic risks. Thus, modelling inputs associated with such an exercise will likely take into account 'extreme' scenarios involving deep and sudden decarbonization (see Figure below). In summary, the final step from a financial regulators perspective, crucially, emphasizes both tail risks more than a typical investor might, as well as analysis of financial risk over economic risk.



Source: 2° Investing Initiative (2016) "Transition Risk Toolbox: Scenarios, Data, and Models"

II. CONCLUSION AND WAY FORWARD

This note acts as a playbook on how financial regulators and climate policymakers could monitor alignment with the Paris Agreement Art. 2.1c, as well as potential financial risk associated with the transition to a low-carbon economy. It provides a specific step-by-step game plan, co-designed as part of an expert technical workshop organized in Piana, France in September 2016. While it leaves a number of key modelling and action points open for financial regulators and policymakers to explore further, the roadmap can form the basis of action. In line with the title of the report, it can help to recruit stakeholders to action. It thus speaks to both national and international supervisory authorities, supranational organizations like the International Monetary Fund and UNFCCC, and climate policymakers.

The political economy of acting on this roadmap will be specific to each country. In some countries, regulatory mandates for central banks and financial supervisory authority are sufficient for these actors to act. Regulators may wish to start this process on a one-off basis and explore more permanent monitoring subsequently. In some geographies, mandates for action are still required. Each of these aspects will be quite idiosyncratic. For example, in the United States and EU, portfolio data disclosure for insurance companies (and mutual fund managers in the US) is already mandatory. Thus, as outlined above, some of these steps may be relatively straight-forward.

While the roadmap may be specific to each country, there may be an interest to ensure comparability and an exchange of learnings across countries. This could be achieved through informal networks of regulators and policymakers or more formal coordination bodies like the IMF or the UNFCCC or the OECD. Such networks and partnerships on this topic require however some level of agreement on the model, data, and scenarios used to inform the assessment.

For actors interested in monitoring, the key follow-up question then becomes ‘what next’? Part of the what next obviously derives from the results of such analysis. Thus, results may suggest the financial sector is on track vis-à-vis the Paris Agreement and not exposed to significant market and / or systemic risk. In this case, further action is likely limited, albeit for the best of reasons. For financial supervisory actors, further action in the case of elevated risk may be microprudential for specific financial institutions or macroprudential, involving a range of potential instruments to reduce financial risk more generally. Obviously, this is highly sensitive issue and may even, if bluntly applied, trigger certain types of risks as financial market actors respond to regulatory signals.

For climate policymakers, the use case may be both reporting against Paris Agreement Art. 2.1c and informing on the efficacy of existing – national or international - climate policy frameworks in driving capital allocation. This could then imply a range of policy options in response, either as part of industrial policies (e.g. carbon pricing, ‘green incentives’) or financial regulatory frameworks.

Finally, there is a broader question of market transparency. Regulators and policymakers may be in a position to report publicly meta-results of the kind currently reported in the context of bank stress-tests. This type of information can support market actors more generally in mapping and tracking the capital transition in financial markets and integrating this information into investment and financing decisions. It can help thus inform microprudential supervisory activities and contribute to public policy guidance.

ABOUT 2° INVESTING INITIATIVE

The 2° Investing Initiative [2° ii] is a multi-stakeholder think tank working to align the financial sector with 2° C climate goals. Our research work seeks to align investment processes of financial institutions with climate goals; develop the metrics and tools to measure the climate friendliness of financial institutions; and mobilize regulatory and policy incentives to shift capital to energy transition financing. The association was founded in 2012 and has offices in Paris, London, Berlin, and New York City.

ET RISK PROJECT

The Energy Transition Risks & Opportunities (ET Risk) research consortium seeks to provide research and tools to assess the financial risk associated with the energy transition. The Consortium is funded by the European Commission and brings together academic researchers (University of Oxford, think tanks (Carbon Tracker Initiative, Institute for Climate Economics, and 2° Investing Initiative), industry experts (The CO-Firm), and financial institutions (Kepler Cheuvreux, S&P Global).

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