# INTEGRATING ESG-CLIMATE ISSUES INTO ASSET ALLOCATION

## CHALLENGES AND PRACTICES

**FIR**
FORUM POUR
L'INVESTISSEMENT
RESPONSABLE

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## WHY IS THIS WORK NECESSARY?

Within asset management, asset allocation is widely agreed to be the primary driver of long-term performance, along with risk management. However, the link between asset allocation and responsible investment practices has scarcely been examined by either industry practitioners or academic researchers in the field of finance.

But taking climate issues into account in the allocation process is essential to achieve the objective defined in 2015 by the Paris agreement to make "finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development". The integration of social issues is equally essential to finance a resilient and inclusive economy. In addition to the issue of performance, consideration of ESG factors is also an impact issue that is attracting growing interest from many investors.

An industry-wide working group – including institutional investors, asset managers and service providers – was therefore set up to explore this important topic. Each institution was represented by a pair of Responsible Investment and Asset Allocation experts.

**Héléna Charrier**, Deputy – Group Sustainability at Caisse des Dépôts and **Jean-Philippe Desmartin**, Head of SRI at Edmond de Rothschild Asset Management, co-leaders of the FIR working group.

Participants approached with self-effacement but seriousness the potential methods for integrating ESG criteria into asset allocation tools and strategy, focusing on the climate change aspect, and starting from the primary needs of long-term investors (insurers, pension funds, etc.). Their discussions focused on several points:

- an overall understanding of the ways of integrating ESG into the allocation process;

- the operational challenges of data identification and use, beginning with climate data;

- the current state of play of practices in the field, by coordinating various associations (the French Asset Management Association, the French Association of Institutional Investors, the French Insurance Federation, and the French Social Investment Forum or "FIR"); and

- research avenues for the academic community.

The resilience of this working group, particularly over the last few months, ultimately made it possible to finalise this handbook. We would like to thank all of its members.

# DESCRIPTION OF THE ASSET ALLOCATION / ALM PROCESS AND IDENTIFICATION OF THE PHASES WHERE ESG IS LIKELY TO HAVE AN IMPACT

Will the current environment become more conducive to integrating ESG criteria into the asset allocation process?

## _____ A process dominated by the regulatory framework

Institutional investors – insurers, banks, pension funds – and in particular their asset allocation and ALM analysis activities, are governed by European regulatory provisions. These provisions introduce technical risk measurement constraints that can make it difficult to integrate climate scenarios, notably because of different time horizons, the need to calculate Value at Risk over a short period of time, or underlying data that are fragmented and/or only historical.

In addition to this regulatory framework, each institution also has a specific accounting framework that adds a further layer in terms of determining asset allocation

Nevertheless, these provisions do not prevent the voluntary integration of climate risk into allocation parameters, for example by considering absolute emissions generated in portfolios, the carbon intensity of different asset classes and scenarios quantifying transition and/or physical risks. In addition, the most recent texts aim to encourage institutional investors to adopt transparency measures on a voluntary basis.

> " _The real challenge for the Investment and Risk functions is to adopt Climate metrics and scenarios in order to constantly improve risk management and to see the management of environmental and social impacts as a genuine source of added value._ "

**Laurence Danesi**, Head of ESG-Climate Integration, Generali Investments France

However, the main regulatory provisions need to encourage consideration of ESG factors, including climate-related aspects, during portfolio construction and investment decision-making:

- Solvency II – capital cost and its calculation method should take into account the longer-term dimension of climate choices: 2°C scenarios and trajectories, for example.

- Basel II – capital requirements determined in function of green investments or bank financing ("green supporting factors")?
- IORP II – going beyond the "optional" introduction of ESG in practice?

The use of "green supporting factors" within the framework of these prudential rules could, for example, be an interesting way of integrating climate risk, despite introducing the need to manage greater complexity and to reconcile potentially different objectives.

## INSURANCE COMPANIES

- Solvency II rules provide a framework for performing ALM analyses and for defining the capital position.

- Solvency II is based on short-term solvency risks – one-year Value at Risk stress testing – whereas analysing climate impacts may involve scenario analyses of 50 years or more.

- In addition, insurers must control their results and manage the distribution of their annual profit sharing in a low-rate environment.

- The new EU regulation "Disclosures relating to sustainable investment and sustainability risks" (DSR) will introduce greater transparency on sustainability risks, including the impact of adverse effects: risk management practices will therefore need to be strengthened with respect to sustainability, climate risks and transition, while lacking sufficient historical data to feed future, long-term scenarios.

## The risk management dimension remains fundamental

Climate change is becoming a new pillar of the Risks and Prudent Person Principle that insurers must apply, as for traditional financial risks (market, liquidity, duration, etc.). It is increasingly being integrated into the standard risk management procedures for the financial risks to which banks and insurance companies are exposed.

Some food for thought:

- Should ESG risks be differentiated depending on whether management approaches are passive or active?

- Which risk hierarchy should be adopted: at the level of the overall portfolio or at the level of each underlying issuer?

- How can investors maintain full asset class and sector diversification?

- How can investors build the prospective dimension of the analysis: scenarios and stress testing?[1]

## The distinction between listed and unlisted assets

As a rule of thumb, institutional investors allocate 90% of their assets to so-called traditional asset classes (government and corporate bonds, equities) and 10% to so-called "real" assets, often unlisted, which have different liquidity profiles and investment horizons: real estate, infrastructure, private debt and private equity. To take account of this situation, it surely makes sense to adopt specific approaches for each of the asset classes considered?

Real assets are considered to be "patient money", i.e. assets that could have the most significant impact on climate issues over a relatively long time horizon (more than 10 years).

In addition, these assets are mostly held directly by institutional investors; they can therefore be pro-actively and easily deployed to address a climate impact objective, unlike listed assets. The impact of real assets will therefore be more direct because they are held by one or by a limited number of institutional investors, with an ESG objective that is often well defined upstream of the investment decision. Finally, real assets are also, by nature, not represented (or only in very small proportions) on market indices.

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[1] *"Climate change: what are the risks for banks and insurance companies?", the French Prudential Supervision and Resolution Authority (ACPR), September 2019; "Governance and management of climate-related risks by French banking institutions: some good practices", May 2020; "Presentation of provisional hypotheses for the pilot climate exercise", May 2020.*

Listed assets, which represent the largest share of investment portfolios, are therefore, by construction, liquid and "tactical" assets, managed over a short-term horizon from an ESG and/or climate perspective. However, the ESG/climate impact of the decision to invest in these listed assets is lower due to the "collective" and therefore relatively diluted holding of this type of asset. Nonetheless, the investor's impact can also be demonstrated through Shareholder Engagement, by encouraging changes in corporate practices.

## The new "EU Climate Transition" and "EU Paris-aligned" benchmarks for listed assets

The development of these equity benchmarks, recently proposed by the European Union, is a positive standardisation initiative. These "climate" benchmarks integrate specific objectives relating to the reduction of greenhouse gas (GHG) emissions and to energy transition, based on the work of the Intergovernmental Panel on Climate Change (IPCC). The benchmarks can be used as steering and comparison tools within an asset allocation strategy and/or as an aid in the context of a policy of targeted engagement on climate issues.

However, it should be noted that these recent benchmarks:

- create new risk/return, volatility and tracking-error profiles that are not aligned with traditional indices based solely on market capitalisation (used in the context of Solvency II, for example);

- require a review of the correlation matrices used in the Solvency II framework; and

- may introduce new biases: if the Utilities sector, for example, is significantly reduced (or eliminated) in these new benchmarks, then the "Value" factor would also be reduced, giving a "Growth" bias to the benchmark.

## Some food for thought

### ▶ Prerequisites

Board of Directors / Management Board: definition of expectations and commitments (COP21, TCFD, or other)

Investment policy: which strategic objectives (transition, 2°C pathway, etc.), models & methodologies (International Energy Agency (IEA), etc.)?

Which strategy for shareholder engagement and voting?

How to ensure alignment with the points above (2°C pathway, transition, reduction of CO2 emissions, etc.)?

The Risk Management function must adopt new non-financial standards and determine the related financial risks (and other risks, such as reputational risks for example).

What reporting is desired/required and achievable? (Article 173 of the French Energy Transition Law? TCFD?)

What metrics are required?

### ▶ Investments

Detailed climate / ESG investment policy including the link to investment decisions

ESG optimisation in tactical allocation and portfolio construction, pending a potential structural regulatory change affecting strategic allocation

Exclusions and possible selective disinvestments: e.g. coal, oil and fossil fuels

Conversion of listed non-ESG assets into ESG or "low carbon" assets.

What about government bonds? A selection could be made, within a defined regulatory framework and on the basis of adapted criteria (CO2 emissions, renewable energies, protection of biodiversity, etc.).

Increased exposure to "green" assets (debt/bonds) and implementation of climate/environmental policies for real assets ("impact")

# IRCANTEC

Since 2015, French public sector pension scheme Ircantec, accompanied by various consulting firms, has been measuring and publishing indicators reflecting the dual impact of climate change on pension scheme reserves and the positioning of its investments to promote the energy and ecological transition.

These indicators (weighted carbon intensity, intensity per million euros invested, green/brown share, identification of the companies that contribute most to the carbon footprint, volume of green bonds, etc.) show the status of the Ircantec portfolio at the end of year N. They are complemented by 2°C alignment and portfolio temperature methodologies (based on the work of the International Energy Agency and Science Based Targets), which provide a forward-looking view on the rate of transition of the scheme's reserves.

For Ircantec, the current challenge is to adopt a more "dynamic" position for its use of some of these indicators, in particular:

- By integrating them into the 2020-2024 strategic allocation model by business sector and asset class in the same way as the risk/return ratio;

- Or, failing that, by setting sectoral carbon intensity levels for 2024 (renewal of the strategic allocation) compatible with a 2°C scenario. This would be equivalent to the intermediate targets that investors demand from issuers and would allow managers to use them, alongside other tools, to measure their alignment.

The first difficulty for Ircantec and Caisse des Dépôts (the scheme's fiduciary manager), as institutional investors, is to avoid the "de facto management" of reserves that would arise if their policies had too great an impact on the investment universes and strategies deployed by the management companies in the dedicated funds, given that some of these companies already have their own alignment methodologies. Given the current state of knowledge and the integration of Scope 3 into intensity measurements, including a "carbon intensity" variable in the allocation model for certain asset classes or sectors would, depending on the level of optimisation, have a strong impact on the sectoral composition of a 2°C-aligned portfolio and index: it would in general mean drastically reducing the presence of industrial sectors to the benefit of tertiary sectors. One of the first projects is therefore to refine Scope 3 and the fair representation of emissions from sectors that are sometimes considered to be "non-core" for the ecological and energy transition (consumption, finance, ICT, buildings).

The second difficulty stems from the functional mismatch between the scientific and financial worlds. On the one hand, scientific methodologies (e.g. IEA) identify emissions-producing activities (steel and aluminium production, aviation) and calculate carbon budgets in absolute terms, while economic and financial players work essentially on a business sector basis and according to relative carbon intensities (in $tCO_2eq/€m$, for example). There is still a lack of collectively agreed and standardised connectors to give more weight and transparency to the assumptions employed in portfolio alignment methodologies.

# CLIMATE STRATEGY:
# TYPES AND SOURCES OF USABLE DATA

The lack of data on the exposure of assets to climate risks, and the difficulties accessing or interpreting these data are considered to be one of the main operational obstacles to effectively integrating climate risks into asset allocation processes.

While climate-related financial data, expressed as an impact on asset risk or return, is rarely available directly, underlying information can be fed into models and tools to construct the necessary data.

> *" The accessibility and quality of ESG data are operational issues common to asset allocation and portfolio management processes. The first challenge is to identify, evaluate and articulate the many sources of information available.* **"**

**Helena Charrier**, Deputy – Group Sustainability of Caisse des Dépôts

These data can be categorised in several ways:
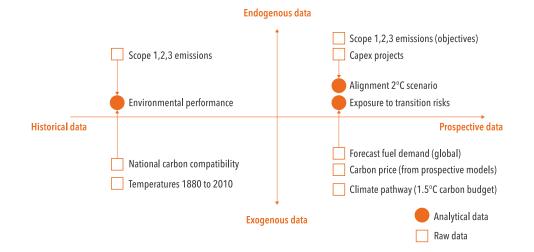
## Endogenous data / Exogenous data

The data available for transcribing and measuring the climate/green profile of issuers or, more precisely, their exposure to climate and environmental risks and opportunities, can be classified into two categories: data that is endogenous or exogenous to the issuer.

- Data endogenous to the issuer:

  The issuer is responsible for the data and controls them directly or indirectly. The data may constitute/reflect the measures implemented by the company (e.g. ESG score, carbon emission reduction targets, remuneration policy, green or brown share), or may comprise results indicators (impact measures such as carbon emissions or avoided emissions). Issuers – corporate or sovereign – can significantly influence the data, which may take different forms: they can be measures of environmental

or climate performance, historical or current, or based on forward-looking models (e.g. carbon emission reduction commitments). They can be expressed as raw indicators, in conventional units, or as a score without units.

- Data exogenous to the issuer:

  These data are by definition variables that are imposed on the issuer that it can neither control nor influence. These variables are generally of a macroeconomic nature and describe the context in which the issuer operates (industry, geographic or regulatory environment, etc.). The data in question are generally available at a national or more aggregated level and may be sourced from historical models (e.g. national GHG accounting, carbon price) or prospective models (e.g. integrated economic models).

**Endogenous data**

- Scope 1,2,3 emissions
- Scope 1,2,3 emissions (objectives)
- Capex projects
- Alignment 2°C scenario
- Environmental performance
- Exposure to transition risks

**Historical data** ——————————————————————— **Prospective data**

- National carbon compatibility
- Temperatures 1880 to 2010
- Forecast fuel demand (global)
- Carbon price (from prospective models)
- Climate pathway (1.5°C carbon budget)

**Exogenous data**

- Analytical data
- Raw data

## Analytical data / Raw data

Climate data may also be distinguished in terms of the extent to which they have been transformed. For instance, within the endogenous/exogenous categories, a distinction can be made between raw data and so-called analytical data.
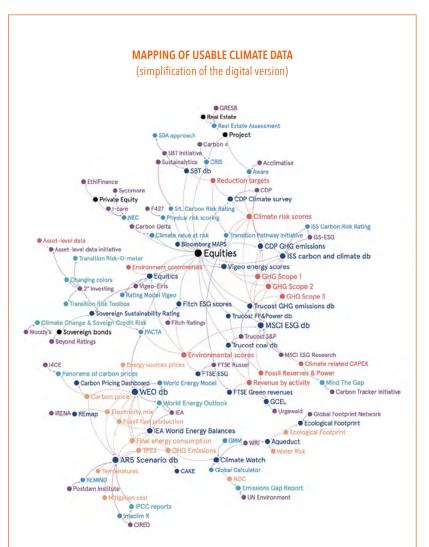
- Raw data: these data have not been specifically modelled by an intermediary (ESG or macroeconomic data provider, rating agency, academic researcher, etc.). The financial community is increasingly interested in this type of unprocessed data.

- Analytical data: these metrics are generated by models that draw on raw data inputs. They include models for estimating raw data not provided by issuers that are used by rating agencies or specialised data providers. Some of the most popular analytical models relating to climate change include temperature models or models for aligning investments with the objectives of the Paris agreement.

## Historical data / Prospective data

A final element used to differentiate climate data is the notion of time horizon.

Historical data reflect an issuer's current or past non-financial performance. Examples include carbon emissions, the green share, or the proportion of corporate revenues that support the energy transition. Prospective data, on the other hand, offer a projection into the future. This may relate to CO2 emission reduction targets or the transition risks associated with a future strengthening of regulation around carbon emissions. The data may also take the form of metrics used to test the alignment of a portfolio, such as temperature or the future carbon trajectory of issuers.

In order to better visualise these different types of data, we have developed an interactive mapping tool to establish a typology of sources and the relationships between the information.

**MAPPING OF USABLE CLIMATE DATA**
(simplification of the digital version)



Key – Resources have been organised into seven categories:

- variables endogenous to issuers
- variables exogenous to issuers
- information-producing organisations (public, private or civil society organisations)
- the databases that issue the information, whether in the public domain or through commercial access
- models that use the information to assess exposure to physical or transition risks
- benchmark reports, which contextualise, present or employ these methods
- the main asset classes for which the identified information is relevant

This non-exhaustive mapping is based on a public, collaborative survey. It will be regularly updated via the FIR website. To suggest the integration or updating of a resource, please go to:

https://www.frenchsif.org/isr-esg/investissement-socialement-responsable-et-ressources/climate-resources-cartography/

The interactive digital version also includes descriptions and links to the resources, as well as various filters.

# PRACTICES OF THE DIFFERENT INVESTOR COMMUNITIES ON THE PARIS MARKET

## _____ A representative panel of investors and actors from the Paris market ecosystem

The survey, which focuses on responsible investment in strategic asset allocation, was conducted among the full population of investors on the Paris market. 77 investors responded, comprising 49% asset managers, 35% institutional investors, 8% consultants and 8% other actors: rating agencies, regulators and associations.

The respondents (analysts, CEOs, CIOs, advisors, portfolio managers, etc.), represent diverse profiles from the research and investment professions, 40% of whom have recognised ESG expertise. The sample of investors was aware and informed of the initiatives concerned: PRI, CSV, SDG, EU Green Taxonomy, TCFD, CDP, etc.[2]

All the investor associations – the French Social Investment Forum or "FIR" (32%), the French Asset Management Association (27%), the French Association of Institutional Investors (19%), the French Insurance Federation (15%) and others (7%) – participated, making a positive contribution to ensuring that the survey was representative of the Paris market.

Historical asset classes and strategies are over-represented, with a balance between equities and fixed income. Active portfolio management accounts for 75% of responses and there is a 60/40 split between listed and private assets.



**77 Investors**

38 — ■ Asset managers
27 — ■ Institutional investors
6 — ■ Advisors
6 — ■ Other actors

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[2] PRI: Principles for Responsible Investment; CSV: Creating Shared Value; SDG: UN Sustainable Development Goals; TCFD: Taskforce for Climate-related Financial Disclosure; CDP: Carbon Disclosure Project;

> " _Our research activities show that there is a growing trend in Europe, and particularly in France, for institutional investors to systematically take into account non-financial dimensions._ "

**Agnès Lossi**, Partner at INDEFI

## _____ Awareness of the importance of ESG

70% of respondents replied positively on the question of the prevalence of ESG criteria in their profession, reflecting the investor experience curve. However, we need to take into account a possible bias on the part of players whose core business is responsible investment.

The question of integrating ESG criteria into asset allocation met with a high level of positive responses (>70%) among all categories of investors, showing

an awareness of the subject. Similarly, reflection on integrating climate-related criteria showed a high level of positive responses (>50%).

The responses received indicated that ESG should be integrated into a long-term approach, generally at the strategic allocation level (71%) rather than at the tactical level (29%). Equities were considered a priority by 85% of respondents, followed by euro credit fixed income, infrastructure and real estate. Although it dominates asset allocation for institutional investors, sovereign fixed income is considered less of a priority at this stage.

The teams involved in ESG transformation belong to the research, investment and risk businesses, with half of the respondents being from these areas. A research/investment pairing appears to be the most likely combination to implement the ESG project.

The main motivations for investors to incorporate ESG criteria are risk analysis and the reputational dimension, which are key for 75% of respondents. The regulatory framework is perceived as an incentive, particularly at the European level. Client demand for integrating ESG/climate issues into allocation/ALM remains modest.

Conversely, the main obstacle to the integration of ESG criteria appears to be the lack of data, followed by the question of materiality and the absence of methodological standards.
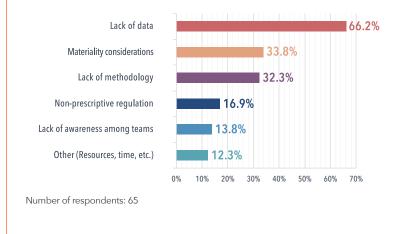
For the purpose of conducting ESG analyses, one-third of management companies replied that they would favour proprietary data (to deal with private assets in particular). For other participants, data sources are balanced between external data on the one hand, and a balance of proprietary internal data and external data on the other.

Regarding the integration of ESG into allocation / ALM processes, expectations are diverse. Half of the respondents anticipate a change in management objectives, with an integration of ESG/climate measures such as, for example, reducing the carbon footprint and the promotion of asset classes and strategies (e.g. low carbon, green bonds, etc.).

**ASSET CLASSES IDENTIFIED AS PRIORITIES**

| Asset class | Percentage |
|---|---|
| Equities | 84.6% |
| Euro credit fixed income | 61.5% |
| Sovereign fixed income | 27.7% |
| High-yield debt | 27.7% |
| Unlisted debt | 26.2% |
| Emerging fixed income | 18.5% |
| Infrastructure | 44.6% |
| Real estate | 44.6% |
| Private equity | 29.2% |
| Other | 3.1% |

Number of respondents: 65

**MAIN OBSTACLES IDENTIFIED FOR THE INTEGRATION OF ESG CRITERIA**

| Obstacle | Percentage |
|---|---|
| Lack of data | 66.2% |
| Materiality considerations | 33.8% |
| Lack of methodology | 32.3% |
| Non-prescriptive regulation | 16.9% |
| Lack of awareness among teams | 13.8% |
| Other (Resources, time, etc.) | 12.3% |

Number of respondents: 65

## International focus: PRI work on ESG and strategic asset allocation

In 2019, the PRI's discussion paper (Embedding ESG into Strategic Asset Allocation Frameworks) and asset allocation workshop on ESG and SAA, set out a number of challenges and opportunities relating to embedding ESG into SAA frameworks to improve financial returns and sustainability outcomes. For the former it was based around recognising the fundamental role SAA decisions play in influencing portfolio returns over timescales that are aligned with macro themes such as resource shortages, governance changes and climate change. The work with signatories in this area points to improved understanding of ESG issues resulting in better understanding of asset class risk / return expectations – critical inputs into the SAA process. For the latter, incorporating sustainability outcomes into asset allocation decisions can make an important contribution to financing SDGs and Paris Agreement goals. There is an enormous gap between the actual and required investment needed to meet these goals and post-COVID, the need for private investment to bridge this gap is even more stark. Including contributions from FIR, the SAA session at the PRI in Person conference in Paris discussed the role the SAA process could and should play in increasing allocation towards solutions to these global challenges.

# AXA GROUP

Asset allocation strategy and climate alignment objectives: including sustainable finance objectives in its strategic asset allocation process and, more importantly, integrating the Paris Agreement objectives, embody several major challenges that AXA Group has chosen to tackle head-on.

## Greening asset allocation choices

On the sidelines of COP21 and starting in 2015, AXA Group has gradually divested from the most emitting industries, such as coal and, later, oil sands. This risk mitigation strategy has been applied by default to all AXA IM's third-party clients with an opt-out mechanism applied in case of outright refusal by the client. At the same time, the Group has also implemented a major low-carbon green investment programme in line with current taxonomies, such as green bonds or buildings and infrastructure.

## Choice of climate performance and alignment measures

Since signing the Montreal Carbon Pledge in 2015, AXA Group has been tracking the carbon footprint of its investments. This measure is essential but it is a historical metric that faces methodological issues and a lack of data for certain types of emissions (Scope 3). It must be supplemented by more qualitative and prospective factors. Starting in 2016 and the first Article 173 reports, AXA Group and AXA IM have jointly investigated new and innovative climate metrics – such as portfolio temperature and climate cost – which are "forward looking" and based on science. This methodological work is a long-term undertaking: it will now be carried out collectively as part of the Net Zero Asset Owner Alliance, which AXA Group joined in November 2019.

## Effects on performance and risk structure: asset allocation strategy and climate objectives in practice

In order to take into account the international climate objectives of limiting carbon emissions until they reach "net zero" in 2050, asset allocation methods will need to be adapted. The approach studied by AXA Group, together with the financial engineering services of AXA Investment Managers, is to develop new asset classes or sub-indices for each of the traditional asset classes, defined according to their presumed level of impact on the climate target:

- Strong impact (negative): High-stakes assets that are very carbon-intensive (assets most exposed to the energy supply, raw materials and transport sectors).
- Moderate impact (negative): High-stakes but less emission-intensive assets (assets exposed to demand sectors that are energy consumers, such as real estate, industry, consumption).
- Low impact: Assets that present a low climate challenge (services, pharmaceuticals, telecommunications, etc.).
- Positive impact: Green or low-carbon assets.

Climate impact can be measured – depending on data availability – using historical and forward-looking metrics. The objective is to determine the economically efficient long-term allocation (expected long-term return, volatility, maximum loss, Value at Risk, etc.) under the additional constraint of the desired climate impact objective.

The ultimate step in this analysis is the internalisation of the climate objective and the climate effects on the expected risks and returns upstream of the asset allocation optimisation process. It involves translating climate risks and opportunities into financial impacts. This link was examined by AXA Group as early as 2016 as part of its TCFD report, using tools such as the Climate Values at Risk, which represent transition and physical risks. An AXA Research Fund programme should make it possible to better formalise these relationships.

# AVENUES OF INVESTIGATION FOR ACADEMIC RESEARCH

> " *Supporting academic research efforts is crucial for sustainable finance to progress. This can take the form of dialogue between researchers and practitioners, funding for chairs or support for awards. This is a vital issue in the era of COVID-19 and climate change.* "

**Benjamin Melman**, Global CIO Edmond de Rothschild AM

Although integrating climate issues into the asset allocation process appears to be essential for financing the energy transition and for the proper management of financial risks related to climate change, this issue has been the subject of limited academic research to date.

Difficulties accessing data is one of the obstacles hindering work on this subject. Certain issues would be of particular operational interest:

## ____ For modelling tools

### Data

**1** | **Given that data can vary by a factor of three, how can we assess and improve the integrity and quality of issuers' carbon reporting? What role should corporate governance bodies play in the production and communication of these data?**

The carbon data that investors rely on (CDP or directly from issuers) are generally estimates, not measures. For Scopes 1 and 2, estimates account for around 80% of the data communicated. For Scopes 3 and 4 (CO2 avoided), the share of estimated figures is even higher. It is therefore necessary to go back to the source of the data to avoid the well-known "garbage in, garbage out" problem, in other words insufficiently reliable and therefore unusable source data. A major issue is governance by boards of directors and management committees to ensure the integrity and quality of the data transmitted. This should be a priority for dialogue and engagement in carbon-intensive sectors (energy, utilities, etc.).

**2** | **Which methods can be used to exploit environmental data?**

Climate risk analysis faces the challenge of collecting granular and predictive data on asset exposure and performance. To what extent can machine learning and artificial intelligence (AI) algorithms be exploited to meet this challenge? What climate data are suitable for this type of algorithm? Which predictive models are sufficiently robust to be considered by large-scale decision-makers (governments, institutional investors, etc.)? If AI is considered as one of the responses to climate risk management, to what extent is the development of AI integrated into the "cost", particularly energy-related, of transition risk?

**3** | **What kinds of robust analytical estimation models need to be developed for environmental data? How can we infer bottom-up from top-down?**

Today, given the ongoing low level of corporate transparency on certain types of raw data such as carbon emissions, a number of non-financial rating agencies, climate solution providers and platforms, such as the CDP itself, are using sector-specific analytical models generally based on an understanding of the supply

chain and sectoral interactions in the production process. The suppliers of these models are not always very transparent. In less rigorous methods, several so-called "approximation" approaches may potentially be used by the same investor despite being inconsistent (e.g., one approximation model for carbon data, another for low-carbon pathways). Models for estimating climate data based on top-down relationships (sector, country, regions) should be based on concepts that are more readily

actionable and accessible to all. Academic researchers could collaborate with data providers or the various existing initiatives – Net Environmental Contribution, CDP, Transition Pathway Initiative – to develop or communicate robust and credible "scientifically proven" approaches. Such an effort would be especially useful and necessary for Scope 3 carbon emissions, which are the least well documented.

## Interest rates

### 4 | What rates should be set for very long-term allocation (50 years)? What obstacles would there be to implementing such a horizon in an asset allocation process?

The damage to the economy caused by global warming will only be fully appreciated over the long term – a fact set out in Mark Carney's speech on the "Tragedy of the Horizon". This long term generally goes well beyond the periods taken into account by institutional investors in their asset allocation. Nevertheless, it is essential to define a very long-term allocation framework to take this into account, as the markets will, to a certain extent, anticipate this economic damage. How can these risks be integrated into strategic asset allocation? What weight should be given to them, i.e. how should they be discounted?

It is interesting to note that the ACPR (the French Prudential Supervision and Resolution Authority) is calling on the main French banking and insurance groups to conduct an initial climate pilot exercise by the end of 2020, with the aim of raising awareness among French investors of the risks associated with climate change by 2050. The ACPR has thus defined an initial methodological framework for the long-term analysis of asset allocations.

## Carbon pricing

### 5 | Which carbon price should be integrated into the ALM process (financial projection angle)?

The question of carbon pricing is central insofar as this price determines the Policy Risk faced by companies and economic agents. The carbon price is directly linked to the damage caused to the economy by global warming because it quantifies the negative externality of carbon emissions. What analytical framework should

be used to assess the carbon price in order to measure its impact on the expected return on assets? Is the simulation approach of Shared Socioeconomic Pathways using Integrated Assessment Models robust? And under what conditions?

## Scenarios

### 6 | What macro and financial scenarios should be developed for an ALM process aligned with achieving the objectives of the Paris Agreement? Which underlying socio-economic scenarios should be retained?

These questions refer more specifically to the Shared Socioeconomic Pathways (SSPs) compatible with the Paris Agreement. Which scenarios are most likely to be retained? More fundamentally, how robust are these pathways in terms of demographic and economic

projections? How can pathways and scenarios other than the SSP be determined to integrate demographic changes, economic growth, carbon emissions and technological progress?

## Classifying activities

### 7 | How can energy and ecological classifications be linked together? Stock market and economic classifications?

Existing stock market classifications are the subject of much debate among practitioners. These debates are primarily of an economic nature, as many issuers do not feel properly represented/understood by their stock market classifications. This is the case, for example, for industrial gas companies, which are classified in the chemical sector. Sustainable development considerations add to the complexity

of the exercise. Sectoral classifications are often disconnected from major sustainability issues. For example, transport activity (road, rail, air, maritime) is classified in a multiplicity of sectors. The Sustainability Accounting Standards Board (SASB) initiative in the United States has begun to address this difficulty, but many obstacles remain.

## For ALM models

### 8 | What impact does climate change have on yield distribution?

How can the results of the Integrated Assessment Models be broken down in terms of economic and monetary fundamentals to obtain scenarios for asset price evolution? Which stochastic techniques are the most robust? How can these scenarios be analysed to derive asset allocation choices (probability, Minimax Regret search, etc.)?

### 9 | How can the climate dimension be integrated into the modelling of sectors with moderate or indirect exposure to climate risks?

Transition risks comprise systemic and sectoral dimensions, and a dimension specific to each actor. It is normal that initial analyses appear to show only a moderate transition risk for certain sectors, namely those with rather low direct emissions (Scope 1). However, when analysed further, the sectoral interconnection throughout the value chain – from supplier to customer – indicates that these sectors may be more widely exposed, due to indirect emissions but also because of possible non-linear tipping points and jumps.

This complexity would appear to merit academic review, at the very least regarding the tools available to measure this interconnection from a climate perspective.

### 10 | How can the climate dimension be integrated into the modelling of real asset classes?

Physical risk could be the object of a "jump to default" type of modelling, in which the methods (equivalent to Loss Given Default and Probability of Default) could initially be sector-specific. The challenge would then be to obtain these relatively granular data, theoretically for an annual time horizon.

Transition risk could be assessed in function of the expected sectoral losses of value added (and therefore of fair value), which is provided for in the climate stress scenarios communicated by the ACPR (the French Prudential Supervision and Resolution Authority). It will thus help to calibrate capital returns trends.

### 11 | How to model market risk and asset-liability risk indicators in function of different climate scenarios?

This modelling is essential for several reasons:

- Market risk is estimated on the basis of historical series, without adjustment for the climate scenario; the sub-sectors of the energy sector are not differentiated with regard to risk parameters (volatility, correlations).

- The net present value of the balance sheet is an asset-liability indicator that is very sensitive to the discount rate. The discount rate determines the timing of investments, and in particular energy transition investments, whose benefits are expected in the long term.

### 12 | How can we enable the interaction of the various data used to produce climate and macroeconomic scenarios?

Introducing a climate constraint brings complexity to the modelling process. This increased complexity requires the use of several types of economic and climate-related data. It is therefore necessary to understand how these data interact in order to better represent the models and interpret the results.

## _____ In terms of strategy and regulation

### Carbon pricing

**13 |** **What effective carbon price is required to align asset allocations (via traditional ALM processes) with the energy and climate scenarios enabling the objectives of the Paris agreement to be achieved (climate economics angle)?**

The various scenarios (issued by sources such as the IEA, IMF, World Bank, EU or private sources) envisage tax levels or emissions quotas that give a very wide range for the explicit or implicit carbon price, in the order of $25 to $100/tCO2eq today, and exceeding $200 by 2050. As the effects on the various asset classes and geographical areas are fairly heterogeneous, which critical price path would lead to an optimal alignment of portfolios at horizons of 5, 10, 20 years and beyond, in order to remain below 2°C? For venture capital firms, what impact would climate change have on prudential risk metrics (e.g. correlation parameters)?

### Taxonomy

**14 |** **How can it be integrated into the calculation of capital requirements?**

In the event of a deviation from the Paris agreement trajectories, a fiscal shock allowing a return to a path consistent with the 2050 objectives could generate losses (the hypothesis adopted by the ACPR in the elaboration of its climate stress tests). These losses could be used as a basis for estimating a transition "cushion". In this type of comprehensive approach, this transition "cushion" should be adjusted according to the probability of the scenario occurring.

Another more granular approach would be to opt for an Environmental Value Adjustment (inspired by the Credit Value Adjustment) that would take into account the impact of physical and transition risks on Exposures At Default.

The discounting of losses remains a major challenge in the integration of climate risk into capital requirements.

### Data

**15 |** **What governance procedures should be put in place for the process of developing standards for estimating the environmental resilience of assets?**

There are currently numerous regulatory and innovation initiatives emanating from the governmental and intergovernmental spheres, and from private actors (investor coalitions, stock market index providers or bodies in charge of accounting and financial standards), stakeholders and inter-professional federations or organisations – at all levels: local, national, regional and international. This phenomenon gives rise to fears of a disparity of rules and standards, with widely varying levels of constraint and, of course, contradictory demands. Such a situation would lead, through the confusion created, to the maintenance of a status quo that is now unacceptable.

It may be desirable to open an in-depth debate on the legitimacy of each actor in this process, as well as on the most appropriate level of implementation of these standards, with well-defined degrees of coercion. Such a debate would significantly reduce the profusion effect, while creating relevant and widely accepted frameworks.

# APPENDICES

## GLOSSARY

### ALM

The process of managing the use of assets and cash flows to reduce the firm's risk of loss from not paying a liability on time.

### Credit Value Adjustment (CVA)

Credit valuation adjustment is a change to the market value of derivative instruments to account for counterparty credit risk. It represents the discount to the standard derivative value that a buyer would offer after taking into account the possibility of a counterparty's default.

### ESG

Environmental, social and governance criteria are a set of standards for a company's operations that responsible investors use to screen potential investments.

### Exposure At Default (EAD)

Is the total value a bank is exposed to when a loan defaults. Financial institutions use the internal ratings-based (IRB) approach to calculate their risk.

### Green supporting factors

Would offer banks the possibility of reducing their cost of capital when investing in a green infrastructure project, such as a wind farm. Conversely, a "Brown penalising factor" could potentially be applied to a coal-related financing project, for example, with the corollary of an increased cost of capital due to a higher risk of pollution in the future.

### Growth investing

An investment style and strategy that is focused on increasing an investor's capital. Growth investors typically invest in growth stocks, companies whose earnings are expected to increase at an above-average rate compared to their industry sector or the overall market.

### Integrated Assessment Models (IAM)

A type of scientific modelling that attempts to link the main features of society and the economy to the biosphere and atmosphere in order to create a single modelling framework. The goal of integrated assessment modelling is to accommodate informed policy-making, usually in the context of climate change, though also in other areas of human and social development.

### Jump To Default

The risk that a financial product, whose value directly depends on the credit quality of one or more entities, may experience sudden price changes due to the unexpected default of one of these entities.

### Loss Given Default (LGD)

The amount of money a bank or other financial institution loses when a borrower defaults on a loan, depicted as a percentage of total exposure at the time of default.

### Minimax Regret

The minimax regret approach is to minimize the worst-case regret. The aim of this is to perform as closely as possible to the optimal course.

### Probability of Default (PD)

Default probability is the likelihood over a specified period, usually one year, that a borrower will not be able to make scheduled repayments.

### Prudent Person Principle

Introduced in Article 132 of the Solvency II Directive, in Section 6 on Investments, with respect to insurers, provident institutions and mutual insurers' investment policies: "With respect to the whole portfolio of assets, insurance and reinsurance undertakings shall only invest in assets and instruments whose risks the undertaking concerned can properly identify, measure, monitor, manage, control and report, and appropriately take into account in the assessment of its overall solvency needs."

(See article 132: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0138&qid=1599567887303&from=EN)

### Shared Socioeconomic Pathways (SSP)

The SSPs are part of a new scenario framework, established by the climate change research community in order to facilitate the integrated analysis of future climate impacts, vulnerabilities, adaptation and mitigation.

### Strategic allocation

A portfolio strategy. The investor sets target allocations for various asset classes and rebalances the portfolio periodically. The portfolio is rebalanced to the original allocations when they deviate significantly from the initial settings due to differing returns from the various assets.

### Tactical allocation

An active management portfolio strategy that shifts the percentage of assets held in various categories to take advantage of market pricing anomalies or strong market sectors.

### Value at Risk (VAR)

Is a statistic that measures and quantifies the level of financial risk within a firm, portfolio or position over a specific time frame.

### Value investing

Is an investment strategy that involves picking stocks that appear to be trading for less than their intrinsic or book value. Value investors actively seek stocks they think the stock market is underestimating.
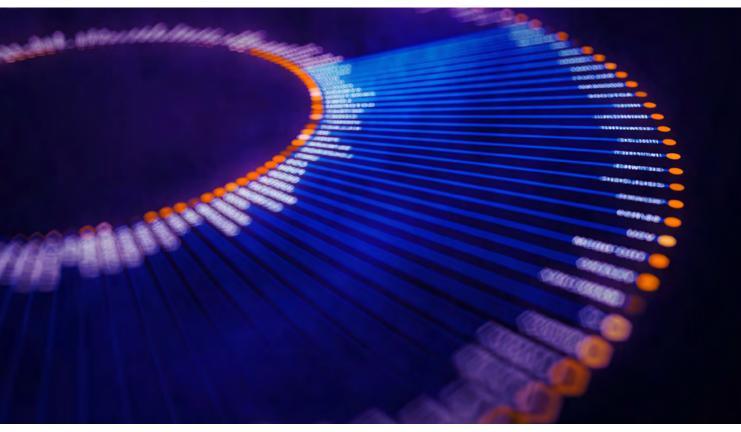
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