



2017 AXA GROUP

Climate Change: Investment Risk Analysis

The search for material ‘carbon risks’

Why should the COP21 “Paris agreement” warrant AXA’s attention? Can climate change have material impacts on our investments? How does this relate to the Award on Investor Climate-related Disclosures?

The relevance of COP21

The “Paris Agreement” was a landmark agreement, which under France’s leadership, reaffirmed with unprecedented clarity that governments are committed to contain global warming below 2°C, address adaptation and resilience and – this is a first - “Making finance flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development”. These commitments bear significant relevance for insurers and investors, pointing towards asset “decarbonization”, green investments and helping populations adapt to the reality of climate change. It is against this context that AXA reaffirms its commitment to play a full role in the climate risks debate. Indeed, AXA’s proactive stance on climate risks has helped generate climate-related developments in the market as well as within certain jurisdictions such as California or Switzerland. Our efforts span a wide range of initiatives including risk management, product development, research and, last but not least, identifying and managing carbon-related risks in our investment portfolios, as described in this Award submission. What have we found out until now?

Article 173

This new French regulation, part of the 2015 “Energy Transition for Green Growth” law, promotes an advanced “climate risks” reporting framework. It places France at the forefront of the climate debate for investors worldwide. We have engaged substantial work in order to develop a rigorous analysis. We are treading new and shifting grounds, with more open questions than answers. What we have started to learn is that there is no magic “climate KPI”, no silver bullets to understanding and measuring the nature of climate-related financial risks. Rather, a patient and tailored analysis of our investments, by asset class, by region, by industry, is what is needed. In this learning phase, we hope our research will bring useful ideas to the “carbon asset risks” debate, and will contribute to improve the mandatory disclosures by year-end.

TCFD

Beyond the Article 173-related work, we believe that understanding, identifying and measuring climate-related risks is complex but is not sufficient. It is also key for investors to understand how portfolio companies report and factor climate-related financial risks into their broader strategy. Promoting transparency and interactions with regulatory frameworks is what the Financial Stability Board’s Taskforce on Climate-Related Financial

Disclosures was set up to achieve. AXA is proud to co-chair the Financial Stability Board's Taskforce on Climate-related Financial Disclosures (TCFD), where it can bring both asset owner and "data reporter" insights.

Better reporting

However, the TCFD's initial "landscaping" work revealed that over 400 climate-related reporting voluntaries and or mandatory regimes are implemented across G20 jurisdictions. These often overlap, contradict each other and request information that has limited materiality. Such a situation can create substantial challenges for reporting companies and investors that can also be left with constraints for which the potential benefits in terms of better risk mitigation are not clear. Mandatory climate-related reporting and transparency will truly enable climate change considerations to become mainstream only if it is deployed in a homogenous framework that focuses on material risks – in short, not more reporting but better reporting.

Both the TCFD and Article 173 embody this approach, which ultimately can drive us towards a green, inclusive and sustainable global economy.

Laurent Clamagirand, AXA Group Chief Investment Officer

Montreal Carbon Pledge: AXA Group's carbon footprint disclosed

AXA has signed the Montreal Carbon Pledge in 2015, committing to assess and publish the carbon intensity of its investments every year. The Group is pleased to share the results of its second global carbon foot-printing, conducted on a large scope of assets, and reaffirms its commitment to address climate-related risks. AXA is well-aware that climate change will have significant impacts on its business and more largely on the resilience of societies worldwide. The Group is also convinced that climate change and the necessary transition to a low-carbon economy represent new challenges and opportunities for its investment business. This is why AXA undertook a carbon footprinting analysis of its general account assets, focused on corporate and sovereign fixed income and equities in 2015. In 2016-2017, AXA added real estate assets.

Our second Montreal Pledge report is also an opportunity to highlight the more sophisticated work AXA is experiencing in regards to the French "Article 173" legislation, and how this can be correlated to the more recent recommendations of the FSB Taskforce on Climate-Related Financial Disclosures (FSB-TCFD).

AXA and climate change

Climate change poses new kinds of risks which must be anticipated and addressed in advance. Insurers are well equipped to address these new types of climate-related risks. They can find and promote risk research and education. They possess data, as well as models and tools to analyze and project this data. They have a duty to unveil and disseminate knowledge such as new risks, including poorly known threats to society. They can build greater climate resilience and in bringing about the behavior changes needed to create a sustainable, low carbon economy. Through their significant investments they are also well positioned to send the right signals to the investment community and to specific invested companies. AXA has been at the forefront of climate action and sees its role as three-fold:

- Understanding the climate risks
- Repairing where there is damage and preventing future damage
- Through our assets and liabilities: on the one side, providing and pricing risk (and, by doing so, helping influence behavior); on the other hand, through where we choose to invest

AXA's strategy regarding climate change is thus to leverage its risk management expertise to better understand and prevent risks and to mobilize its investment capacity to finance and encourage the energy transition. This strategy supports both the "mitigation" and the "adaptation" dimensions of climate change.

Measuring the carbon intensity of AXA's general account

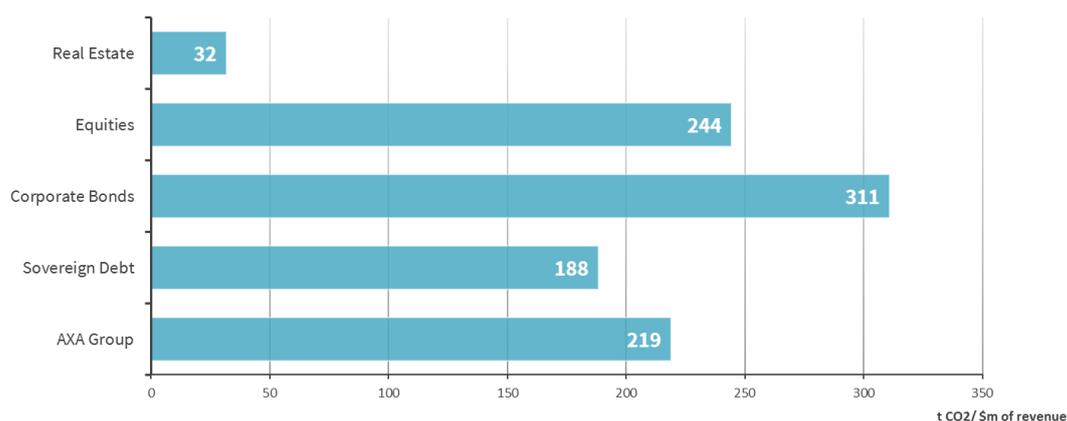
Methodology

The methodology used for this footprinting exercise is a "Carbon Intensity" approach based on TruCost data (a specialist data vendor). Each company or country carbon emission is divided by its revenue or GDP; an average weighted result is then computed taking into account the considered investment universe.

$$\text{AXA's carbon intensity} = \sum_i \left(\frac{\text{carbon emissions}_i}{\text{revenues}_i} \right) \times \left(\frac{\text{exposure}_i}{\text{asset class exposure}} \right)$$

For Real Estate assets, this is normalised against square meters. The scope of this measure includes all AXA's General Account internally managed for which Trucost data is available.

AXA Group CO2 Footprint by asset class



Our 2016 analysis shows the following data:

Asset class	2016 Assets under management	2015 Carbon intensity	2016 Carbon intensity	Trend
General Accounts Assets	€ 597 bn	-	-	
Carbon Footprint: full perimeter	€ 483 bn	284 T CO ₂ / \$m revenues	219 T CO ₂ / \$m revenues	↓
Equities	€ 17 bn	322 T CO ₂ / \$m revenues	244 T CO ₂ / \$m revenues	↓
Corporate Bonds	€ 201 bn	387 T CO ₂ / \$m revenues	311 T CO ₂ / \$m revenues	↓
Sovereign Debt	€ 232 bn	216 T CO ₂ / \$m revenues	188 T CO ₂ / \$m revenues	↓
Real Estate	€ 31 bn	Not monitored	32 kg CO ₂ / m ² floor space	-

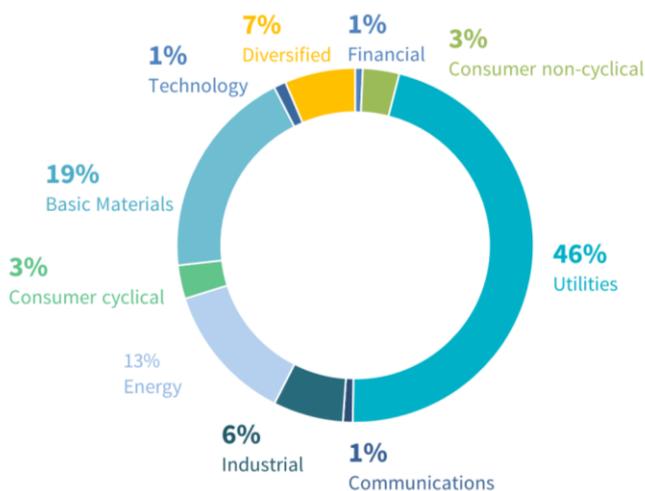
2016 main highlights

Compared to our initial 2015 analysis, the total carbon intensity of our investments has decreased on all asset classes under review. On average, AXA's Carbon Intensity is 219 Tons of CO₂e per Million USD of revenues in 2016, down from 284 T CO₂ / \$m in 2015. This decrease has notably been driven by our coal divestment policy as well as other shifts in asset allocation. In 2017, AXA added Real Estate as a new asset class for this carbon intensity analysis, with an adapted methodology normalised per square meter of floor space. *Note: the average carbon intensity, combining corporate carbon intensity with sovereign carbon intensity leads to some double-counting of emissions.*

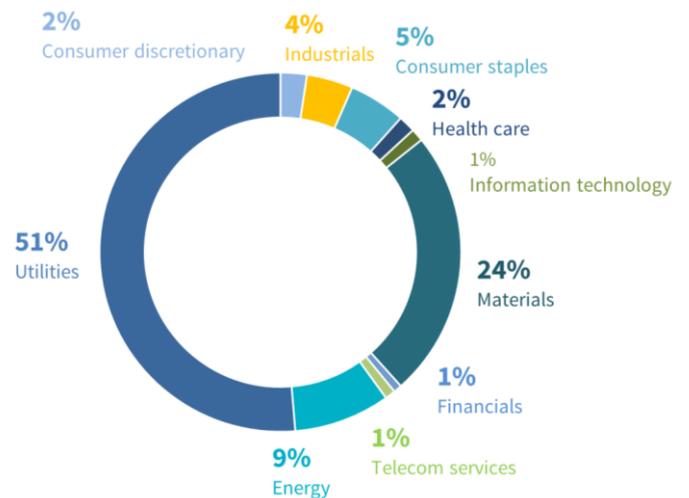
This favorable trend can be explained by 3 factors:

- Sovereign Debt is less carbon intensive by 13 tons thanks to a downward trend in the GhG emissions of countries such as France, Belgium and Italy.
- Corporate Bonds and Equities are less carbon intensive by respectively 35 and 4 tons, thanks to a sector allocation and a company-level selection shift from the most carbon intensive industries (Utilities). This is also a direct consequence of AXA's Coal divestment.
- Real Estate also contributes to the decrease of AXA's average Carbon intensity. The CO₂ intensity for Real Estate is expressed in a specific unit (kg/m²) and covers only direct emissions.

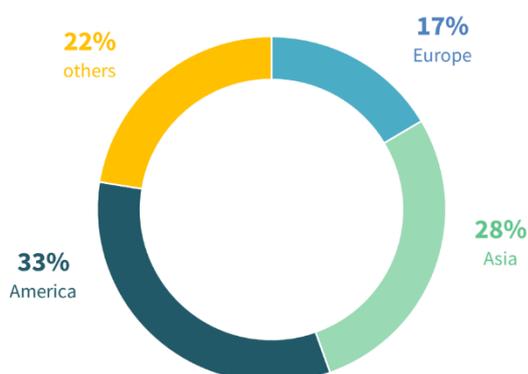
Corporate Bonds:
CO₂ Footprint Sector Contribution



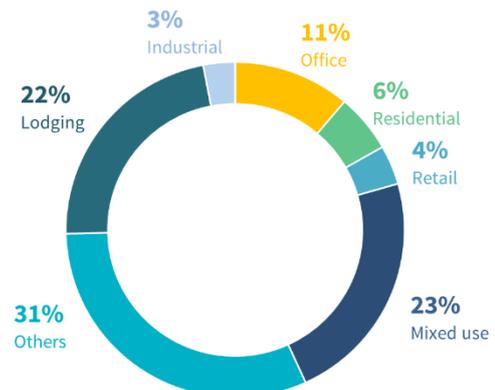
Equities:
CO₂ Footprint contribution by sectors



Sovereign Debt:
CO₂ Footprint Regional Contribution



Real Estate:
CO₂ Footprint contribution by typology



The limits of carbon footprinting

This footprinting work highlights our portfolio's largest carbon emitters, which may be an interesting "carbon asset risk" proxy. It is a potentially useful tool to understand high carbon holdings, revealing that while broad asset-class level figures do not provide useful insights, a breakdown into sub-sectors shows highly different levels of carbon intensity per industry. This can inform engagement efforts with, for example, the Utilities, Oil & gas and Materials sectors which account for the highest carbon emissions. However, some limitations remain:

- The benchmarks used for comparison are generally biased toward fossil fuels compared to the "real" economy.
- Carbon data coverage can be incomplete for certain asset classes, and may not be the right metric for target-setting purposes.
- Carbon data is a snapshot of current emissions, but is not forward-looking. As such, it appears in-

sufficient to clearly identify players across industries that are contributing to the low carbon economy. It highlights today's carbon emitters, but not tomorrow's low carbon solutions providers.

These challenges with carbon footprinting are no reason for inaction. AXA believes that such analyses require further investigation and that currently such metrics are not yet appropriate tools for piloting the transition to a low carbon economy or for reducing "carbon asset risks". This is why we support initiatives such as the FSB Climate TaskForce on Climate-related Financial Disclosures, pushing for improved "financially material" carbon disclosures, collaborative engagement efforts to analyze these limitations and explore more forward-looking and granular options, or the Article 173, a French regulation requiring investors to disclose their ESG (Environmental, Social and Governance) and climate finance strategies.

The Article 173, a regulatory requirement to analyze carbon asset risk

The French Energy Transition for Green Growth Law, also known as the "Energy Transition" Law was passed in August 2015. The adoption of law has set a new standard in the carbon reporting. It encourages financial communities and investors to engage on sustainability issues, more precisely on energy transition and green growth. The law requires investors to disclose how they factor in carbon related aspects and risks in their investment policies. This also means driving a new thinking beyond the reporting frameworks such as, "How does impacts portfolio decarbonization and minimize the carbon footprint of our funds?" and "what type of assets should constitute such a portfolio?" It is against this backdrop that France chose to develop this new piece of regulation, named Article 173, which is an investor-focused subset of a broader "Energy Transition" law. In doing so, France became the first

country to request that investors disclose advanced climate risks analyses, in an effort to encourage financial markets to fully integrate climate risks into financing.

Article 173 takes the debate to a more complex space by requiring investors (both asset owners and asset managers) to initiate a deeper analysis of "carbon-related" risks. These include reporting on how we integrate sustainability and climate-related considerations into our investment analyses, how we may be exposed to "carbon" risks (e.g. as portfolio companies adjust or fail to adjust to a low-carbon economy), whether we conduct "carbon stress tests" on our assets (e.g. in case of a high price on carbon), or even if and how we measure our investments' contribution to energy transition scenarios. This information must be included in our main annual financial reporting.

Integrating climate-related risks

AXA factors climate-related risks into its Responsible Investment process since 2015. Our analysis of the consequences of climate change on our investments focuses on “transition risks” as well as “physical” risks, as described below.

Energy transition risks

The 2015 COP21 “Paris Agreement” stressed the need for businesses and investors to transition away from carbon-intensive models of development, towards a more sustainable, low-carbon economy. This energy transition will, in due course, trigger significant shifts in industrial, financial and consumption patterns. Some businesses will benefit from this shift, while others may fail to adapt or grasp new opportunities. This will impact their ability to generate profits, which becomes a “transition risk” for investors. To date, the Group’s main energy transition-related initiatives include:

Coal divestment

Carbon emissions will require significant curbing to reduce the risk climate change, which may place business constraints on carbon-intensive industries, leaving some assets “stranded”, which in turn may lead to reduced valuations. Current valuation models may not account for such risks adequately. In May 2015, following a careful analysis of this “stranded assets” hypothesis, AXA decided to divest from companies most exposed to coal-related activities. This first-mover event helped place coal divestment on the agenda of many other mainstream investors, ahead of COP21. The divestment concerns electric utilities and mining sectors deriving over 50% of their turnover from coal combustion/coal mining. The €500 million divestment covered both equity and corporate Fixed Income and was finalized by year-end 2015 (fixed income assets divested long before maturity). The divestment reduced portfolio risk but also sent a positive signal to markets and regulators, it is consistent with our ESG integration process, it supports the energy transition, and it is also

consistent with our broader Corporate Responsibility strategy to promote a “stronger and safer” society.

Green investments

In May 2015, the Group committed to tripling its green investments, aiming to reach over €3 billion by 2020 for its General Accounts, in the belief that these assets may benefit from a transition to a low-carbon economy, but it also represented a commitment to promote this transition. These investments will principally be in renewable energy infrastructure debt and equity, as well as green bonds. The Group currently has approximately €1.8 billion of “green” investments across different asset classes, including infrastructure debt and equity, green bonds and private equity. This figure includes capital invested in the Group Impact Investment Fund, in infrastructure debt and equity, and in Green bonds – including the pioneering sovereign Green bond issued by the French Government in January 2017;

Carbon footprinting

AXA signed the “Montreal Carbon Pledge” in 2015, committing to assess and disclose the carbon intensity of its investments. The 2016 analysis features above.

Internal “ESG Impact reports”

AXA IM develops *ad hoc* reports with ESG and carbon data, across a large variety of funds. The reports cover the average ESG score vs benchmarks, main holdings, carbon footprint, water, diversity, etc. AXA IM strives to add data such as “Green Share”, energy mix (exposure to renewables) or engagement statistics related to environmental issues.

Physical risks: measuring the impact of climate events on our investments

In addition to the above “transition” risks, climate change is likely to increase the frequency and severity of extreme weather events, which may impact our most exposed investments, notably Real Estate holdings. This hypothesis is worth exploring considering the size of AXA’s Real Estate assets under management. In 2016, AXA decided to analyse such “physical risks” for some of its real assets and infrastructure assets, focusing on a total of €15 billion across a Property portfolio and an Infrastructure debt portfolio, with assets essentially based in Europe.

Our physical risk assessment methodology uses the approach of our Risk Management team to analyse the extent to which natural catastrophes (“NatCat” models – generally used to assess claims-related exposure) would impact our assets. We have performed the assessments using the most common

catastrophic events in Europe, cross-checked with an individual geolocalisation of each RE asset. Specific “destruction rates”, which factor location, building type and construction materials are used to determine potential damage rates.

Our results show that if a severe 100-year storm were to happen this year, the cumulated loss experienced by the two portfolios would be roughly €15 million. With an average annual loss approach, the combined portfolios have an average annual destruction loss of €0.8 million. If we consider that these investments last around 30 years, we can conclude that the cumulative annual losses experienced over these 30 years may be €24 million. This novel analysis requires further refinement, such as an extension to more portfolios or more catastrophic event types. This work is described in more detail [here](#).

Portfolio alignment with decarbonization objectives

Converting international climate objectives (such as those derived from the COP21 Paris Agreement, French or EU energy mix targets) into quantitative investment targets is a new and complex risk modelling exercise which AXA initiated in 2016. AXA’s approach is two-fold: testing the alignment of our investments with the International Energy Agency’s “2°C” scenario, and testing the contribution of our investments to the energy and ecological transition measured by the percent of companies’ revenues derived from “eco-activities”, or so-called “green share”.

To meet subsequent potential climate goals, we used three methodologies for improving investment decisions:

- assessing transition risk in high-carbon sectors;
- back-testing portfolios to identify a plan for stock reallocation to meet the 2°C benchmark;
- maximizing energy and ecology transition impact by increasing “green share”.

This analysis was tested on representative (diversified and large) portfolios: one AXA France Corporate Bonds and one equity portfolio. AXA focused on three sectors for which “energy transition” as well as “stranded assets” scenarios can be applied with reasonable relevance and data availability: Oil & Gas, Automotive and Electric Utilities, and also taking into account national/regional scenarios and constraints.

This approach matches securities with their current and planned physical underlying assets and production levels by technology. For example, each electric utility is matched with both the current owned and formally planned generation assets by generation type, then compared to the energy mix outlined under the IEA 2°C scenario for utilities. Oil & gas companies are matched with their current and forecasted production levels, based on a ratio of their current production to future proven reserves (in order to estimate their future production), then compared to required production curves under the

IEA 2°C scenario. Automotive players are matched with their current and planned fleet production ratio by powertrain technology (electric, hybrid, diesel, etc.) and compared to the technology shift outlined under the IEA 2°C Scenario.

By assessing the type and nature of the business activities of the companies in which we invest, and back-testing portfolios against energy transition scenarios, we believe we can better identify “transition risks” as well as encourage this energy transition. However, many shortcomings remain in

the various methodologies we have tested, and these will need to be addressed through further research.

The results of this extensive analysis are described in far more detail (by sector and by asset class) [in our public submission to the French Government’s 2016 award](#) on “Best Investor Climate-Related Disclosures”. AXA won the first prize in this contest designed to foster innovative “Article 173” reports. The international jury particularly praised AXA’s work on risk analysis as well as the overall consistency of our approach.

Shareholder engagement

The results of these tests may also be used to inform engagement on sector-specific issues. However, AXA’s shareholder engagement activities pre-date the above analysis. Indeed, AXA uses its influence as a large asset owner to encourage ESG best practice in its portfolio companies. Our recent engagement initiatives include the following:

- In 2016, AXA decided to strengthen its shareholder engagement at Group-level, complementing existing efforts at AXA Investment Managers and AB level. This included for example joining a collective engagement initiative on the issue of Arctic Oil drilling
- The “ESG Footprint Committee”, a RIC sub-committee, reviews risks posed by companies presenting both a low ESG performance and serious and persistent controversies. This committee’s decisions range from “No concerns” (the company remains eligible for investments), “Concerns” (the Credit team initiates further reviews, potentially leading to shareholder engagement), to “Overriding

concerns” (divestment). Several companies have already been engaged via this Committee; AXA

- Investment Managers has a dedicated shareholder engagement team, with over ten years of stewardship experience. AXA Investment Managers tracks its engagements and progress against established objectives which are publicly disclosed online. In 2016, AXA Investment Managers conducted 230 direct engagements and supported 6 collaborative initiatives. Environmental issues represent 30% of this engagement. AXA Investment Managers also discloses its “dissenting” voting statistics. See [AXA Investment Managers Stewardship Report](#).
- AXA Investment Managers joined “Aiming for A” in 2015, a major collective shareholder engagement initiative urging certain companies to improve their reporting on transition risks
- Following the 2015 Volkswagen emissions scandal, AXA also joined the ShareAction initiative, seeking answers to specific questions regarding carbon and SOX/NOX emissions standards from the automotive sector.

Outreach on sustainable finance

AXA communicates on climate change on an ongoing basis towards the general public as well as its clients via various publications, videos, conferences and online on www.axa.com. AXA also conducts active outreach on climate risks towards public authorities, regulators, experts and market actors. AXA believes it has a responsibility to inform public policy on the importance of tackling and adapting to climate change. Recent examples of this approach include:

- AXA was named Vice-Chair of the G20/FSB Task Force on Climate-related Financial Disclosures (TCFD) in 2015. Its mandate is to develop voluntary, consistent climate-related financial risk disclosures for use by companies in providing information to investors, lenders, insurers, and other stakeholders. The final report, which was submitted to the Financial Stability Board (FSB) and the G20 in early 2017, considers the physical, liability and transition risks associated with climate change, and suggest effective financial disclosures across industries. The Task Force's recommendations also apply to financial-sector organizations, including banks, insurance companies, asset managers, and asset owners. AXA and the TCFD hope that ultimately the recommendations will help institutionalize how climate-related risks and opportunities are assessed within companies, and will promote an informed understanding of climate-related risks and opportunities by investors.
- Since January 2017, AXA chairs the EU High-Level Expert Group on Sustainable Finance, launched by the European Commission. Its objective is to help develop an overarching and comprehensive EU strategy on sustainable finance and to integrate sustainability in EU financial policy and regulation, in the context of the Capital Markets Union. It will identify for example the current bottlenecks hampering sustainable finance, the regulatory instruments to be leveraged for effective implementation, as well as the main risks for the EU financial system. The Group will submit a final report to the Commission by end of 2017.
- AXA also co-chairs the Global Steering Committee of the Finance Initiative of the United Nations Environment (UNEP FI) and is an Advisory Board member of the OECD's Centre on Green Finance and Investment.

FSB Taskforce on Climate-related Financial Disclosures (TCFD) correspondence table

The following table cross-references the above content (based on the structure of the Article 173 decree as well as Grenelle 2) with the FSB TCFD final draft recommendations published in December 2016, in our 2016 Annual Financial Report. While these recommendations are not yet finalized, AXA nonetheless strives to proactively address many

of the items recommended for disclosure in the “Supplemental Guidance” (both Insurance companies and Asset owners), owing to our active role within the TCFD throughout 2016.

The overlap amongst referenced sections reflects both a broad cross-referencing approach and the differences in reporting frameworks.

Dimension	Recommended TCFD disclosure	AXA 2016 Reference Document: main relevant sections
Governance	Board oversight	<ul style="list-style-type: none"> Chapter 7.5 Responsible Investment > ESG and climate-related governance
	Management oversight	<ul style="list-style-type: none"> Chapter 7.5 Responsible Investment > ESG and climate-related governance
Strategy	Identification and business impact of climate-related risks and opportunities, including products	<ul style="list-style-type: none"> Chapter 4.1 Risk factors Chapter 7.2 Environmental information > Business-related environmental initiatives (products) Chapter 7.5 > Responsible investment
	Factoring into investment strategy	<ul style="list-style-type: none"> Chapter 7.5 Responsible Investments > Energy transition risks > Coal divestment, Green investments
	Portfolio positioning against 2°C scenarios	<ul style="list-style-type: none"> Chapter 7.5 Responsible Investment > Portfolio alignment with decarbonization objectives
Risk Management	Risk identification	<ul style="list-style-type: none"> Chapter 4.1 Risk factors Chapter 7.5 Responsible Investment > Integrating Climate-related risks
	Physical and transition risks	<ul style="list-style-type: none"> Chapter 4.1 Risk factors Chapter 7.5 Responsible Investment > Integrating Climate-related risks > Energy transition risks, Physical Risks
	Risk Management tools and models	<ul style="list-style-type: none"> Chapter 4.2 Internal Control and Risk Management Chapter 7.5 Responsible Investment > Integrating Climate-related risks
	Shareholder engagement	<ul style="list-style-type: none"> Chapter 7.5 Responsible Investment > Shareholder engagement
Metrics and targets	Aggregated P&C business risk exposure	<ul style="list-style-type: none"> Chapter 4.6 Insurance Risks
	Metrics used to assess climate risks	<ul style="list-style-type: none"> Chapter 4.1 Risk factors Chapter 7.5 Responsible Investment > Integrating Climate-related risks > Energy transition risks > Carbon footprinting Chapter 7.5 Responsible Investment > Portfolio alignment with decarbonization objectives
	Direct carbon emissions and targets against GHG Protocol Scopes 1, 2 and 3	<ul style="list-style-type: none"> Chapter 7.2 Environmental information > Performance targets Chapter 7.2 Environmental information > Environmental data reporting table
	Carbon intensity of investments	<ul style="list-style-type: none"> Chapter 7.5 Responsible Investment > Integrating Climate-related risks > Energy transition risks > Carbon footprinting

