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AFME OVERVIEW OF THE KEY LEARNINGS BY INDUSTRY OF THE 2022 ECB CLIMATE RISK STRESS TEST

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Executive Summary

In line with the ECB's strategic priorities for 2022-2024, AFME members participated in the 2022 climate risk stress test which was established to assess their level of preparedness for managing climate-related risks alongside several other initiatives[1]. In so doing the ECB emphasised the nature of the stress test as a joint learning exercise to help create awareness of climate risk among the supervised institutions and make it easier to ascertain banks' vulnerabilities to, and resilience against, the materialisation of climate-related risks.

Our members have been highly engaged in this undertaking and strongly welcome the nature of the stress test as a learning exercise which has shed light on areas where they will need to build up capacity on this highly important topic going forward. In order to support the findings of the climate risk stress test and further development of these exercises as a tool for ongoing assessment of the progress to manage such climate-related risks in future, we have surveyed our members. The initial assessment of the stress test and survey results are set out in this paper and are summarised below.

Scope: Members reviewed the exposure / risk type coverage, geographies, times horizons and data requirements which were determined by the ECB and whether or not the exercise should have considered unexpected losses. Members identified that the exposure / risk type coverage and scope of geographies for the long-term scenarios as areas for future consideration. On balance the time horizons were deemed appropriate, and until the methodology has improved it would be too early to assess unexpected losses. Members also identified the scope of NACE codes as an area for further industry collaboration and data improvement.

Methodology: Members identified the key challenges in relation to the methodology and data availability related to modules 2 (metrics) and 3 (bottom-up stress test) covering credit, market and operational risks, which also confirm the findings of the ECB among additional observations on how to improve these areas in future exercises.

In addition to reviewing the key features of the process determined by the ECB, banks also provided feedback the way in which the final results were presented by the ECB and areas where industry should collaborate in future. In particular it should be noted that while the ECB emphasised the learning aspect of this process – which is highly appreciated by industry –, the way in which the results were announced was not fully consistent with this and tended to focus on the shortcomings of banks rather than the overall shortcoming demonstrated in the framework to enable banks to prepare for climate risks (e.g. public data and scenarios). We look forward to addressing these overall shortcomings together with authorities to support further meaningful analysis of climate risks.

In this vein, based on the initial findings of this survey, we plan to further study where the stress test proved to be most challenging, or could benefit from further industry collaboration to support the development of the ECB best practices and evolution of climate risk stress testing in future.

[1] The ongoing supervisory thematic review of banks' climate-related and environmental risk management practices and the extent to which banks are aligned with the ECB's supervisory expectations as outlined in its Guide on climate-related and environmental risks.

1. Introduction

The ECB climate stress tests have been a welcome learning exercise for banks and supervisors alike. In this vein we have undertaken a snapshot survey our members who participated in the ECB Climate risk exercise immediately after it ended[2]. This paper presents their initial collective view on the scope, methodology and the process of undertaking the exercise.

The views presented in this paper should by no means be considered a definitive industry view, nonetheless we hope that it will serve as a useful preliminary basis for the ECB to draw its conclusions – together with its own reflections – in the lessons-learnt exercise it plans to undertake in the second half of 2022.

Undertaking a comprehensive lessons-learnt exercise will be critical given that the industry expects Climate Risk stress tests to become a more regular feature of climate risk analysis. This will help the banks and supervisors to better understand how and where climate risks might emerge on their balance sheet and the transmission channels. In so doing, we hope this will lead the ECB and banks to refine and improve on banks' climate stress testing capabilities. It will also underpin the ongoing work to enhance the availability and reliability of climate data from the companies which banks finance. We intend to investigate the findings represented in this survey and present a more considered view on the priorities for this topic in September.

Of AFME members that were involved in the ECB climate risk stress tests, 12 banks participated in the snapshot survey on anonymous basis. Banks which participated in the survey are referred to in this paper as 'Member (s)'/ 'Respondents'.

2. Scope and Methodology

2.1 Materiality

The Climate risk stress test consisted of three modules: a questionnaire, a requirement for banks to calculate climate risk metrics, and, most significant for AFME members, a bottom-up stress test projection covering credit, market and operational risks.

In terms of Module 3, the bottom-up stress test 67% of respondents consider the exercise to have covered **all material risk types**.

For those that did not agree they noted that other risk types which might be material and were not covered in the scope of Module 3 included business risk, reputational risk, operational risk, insurance risk (i.e. banks' insurance companies), reputational and market risk. With regard to Market risk **one member** noted the following items were not covered:

- Market Risk (Both Trading and Banking Books) and Non-Financial Risk in the long-term scenarios;
- Market risk/Interest rate risk in the Banking Books and Non-Financial Risk in the short-term scenario;
- Second order/spill-over risk in the physical risk scenarios.

[2] The survey took place from 01/07/2022 – 21/07/2022

Members were split on whether the stress test covered risk types **not materially** affected by Climate Risk. Some members did not consider Market Risk to be a materially affected risk and would welcome a discussion on this point for future exercises. In particular, it was mentioned the dynamic nature of the market and the short-term disorderly scenario led them to consider this risk type non-material.

It was also noted that Operational Risk was not considered material from a physical risk perspective. Further, the choice of addressing physical risk as a set of short-term events led one member to view it as non-material.

91% of respondents **support** the idea of materiality thresholds to avoid undue effort. This could be done in a number of ways: per risk type, portfolio (exclusion of certain portfolios), thresholds for clients' exposures in the long-term transition scenarios; and thresholds for physical risk scenarios.

In terms of defining thresholds members suggested:

- Waiving exposures/ sectors below a % of representativeness.
- Consider environmental scores differentiated by sectors, transition and physical risk and the materiality of bank positions on each segment.
- Identification of a list of material sectors/segments on which each bank should pose particular attention to during the climate risk assessment.
- Calibrating the threshold based on the effective (relative) exposure of the bank towards the most impacted portfolio\sector (for instance, under Drought and Heat scenario, the % of Exposure in Agriculture, Forestry and Construction sectors could be a meaningful driver for setting the threshold) Credit Risk: threshold used in the ECB exercise was appropriate at 0.05% of total assets as reported in FINREP. The same principle could be applied for Market Risk (i.e. trading exemption criteria).

2.2. (Un)expected losses

The ECB required banks to provide expected credit loss projections for exposures and credit risk parameters and the stock of provisions as at the end of 2022, but banks were not expected to include second round effects in these projections such as those borne by the insurance industry or government.

64% of respondents **did not think it would be appropriate** for the stress test to capture unexpected losses (e.g. via REA) at this stage, the main reason cited was that banks' measurement methods are not yet mature enough; here banks emphasised that relevant input data is not yet available across the piece, for instance with respect to EPC availability and time series. It was noted this exercise should be maintained as a learning exercise due to the lack of maturity in this type of stress testing and banks' internal capital frameworks. One area that could be reflected on by banks, but would also need public attention due to lack of reliable data, would be potential impact of physical and transition risks on value of real estate properties used as collateral for mortgages.

2.3 Geographies

As part of the scope the ECB provided a list of country/regional breakdown that banks should provide when undertaking the bottom-up stress test for different scenarios Module 3. For the short-term scenario the scope was limited to the 5 top countries or those where 80% exposure was. For the long term scenario banks were asked to concentrate their efforts on their primary country of loan activity as determined under the short-term transition analysis.

Further, for the physical risk sub module, exposures to EU counterparties where the underlying collateral was not located in the EU were not in scope. Moreover, exposures to non-EU counterparties were generally not considered in scope, even if the underlying collateral is located within the EU. Under module 2 metric 1 the scope encompassed the interest, fee and commission income from non-financial corporations domiciled in both EU and non-EU countries.

60% of the respondents would **support** amending the scope of the geographies to be reported.

In terms of the exercise itself it was noted that focusing on only the 5 top countries or those where 80% exposure was workable for the short-term scenario and made it more manageable. However, with regard to the long-term scenarios the criteria limited significantly the number of countries included, especially for those banks with a more diversified geography. It was also suggested same criteria applied for identifying the short-term perimeter should be extended to the long-term projections perimeter. A further suggestion was that geographies could be limited to those countries with similar environmental standards as the EU or separate their results from the EU scope so that entities can be fairly compared. Another member proposed that some flexibility could be incorporated (e.g. by scenario) to cover a representative share of the bank exposure or business model.

2.4 NACE codes

Banks were asked to split their corporate exposures between **22 industries** according to a pre-defined list of **NACE sectors**.

55% of respondents would **support** the list of NACE codes being adapted. For those members that supported adaptations, it was suggested the ECB could consider reducing the number of NACEs in focus to only those sectors shown to produce meaningful stress impacts, the amount of manufacturing sectors and most vulnerable sectors. Furthermore, greater NACE granularity into sectors where stress impacts are meaningful is suggested.

It was also noted that the assessment of sectors and the disclosure of conclusions needs to be done carefully. Classifying a list of sectors as 'most polluting' could lead to frontrunning other regulatory discussions regarding a brown taxonomy. This is particularly relevant when some sectors include both polluting and non-polluting companies (like renewables within the electricity sector). As both kind of customers cannot be disentangled, conclusions and RAG classifications might be misleading.

Additionally, it was noted that a wide range of emissions can be found among the 22 sectors. However, while this is explained in the detailed reports ('…highly GHG-intensive industries … account for a lower but still significant share of reported income (21%)…', it is presented under a heading which could mis-lead ('almost two- thirds of banks' income from non-financial corporate customers stems from greenhouse gas-intensive industries').

2.5 Time horizons

The bottom-up stress test (module 3) asked relevant banks to project EL under **transitional risk** with time horizons of **3 years** (so called short-term tail risk) **and 30 years** (leading up to 2050 in 10-year intervals, so called long-term strategic response). With respect to **physical risks**, banks were asked to analyse two different events and derive **one-year-ahead** projections.

73% of banks **agreed** in general with the time horizons established by the ECB for this exercise. It was acknowledged that the timelines reflect the EU's initiatives and set a standard.

As regards the transitional risk, it was commented that the short-term projections were not fully realistic for transition risk, however they were practical nonetheless as it aligned with banks' internal capital planning horizon. Long-term scenarios seem to be the most appropriate together with a dynamic balance sheet assumption, but banks commented that it is challenging to assess the strategic decision making under the scenarios. It was also raised that the long-term horizon was a little too long, and that a 10-year horizon would be more helpful, for instance in terms of linking the ECB exercise with internal approaches for example for the residential real estate portfolio.

In terms of physical risk, it was noted that maturity is less relevant although the assumption for acute impact in 2022 was considered practical.

2.6 Data observations for Module 2 and Module 3

Under module 2, banks were asked to provide an overview of their **reliance on revenues** to GHG intensive sectors (metric 1) and how much **GHG emissions they finance** (metric 2). The metrics relied on scope 1, 2 and 3 GHG emissions. The metric targeted the corporate exposure to non-SME non-financial obligors, both direct counterparties and holding companies. The exposure definitions were aligned with the CRR. The financial information should be based on FinRep definitions.

The climate risk stress test (module 3) had been designed as a bottom-up stress test and as such required banks to provide starting point data (reference date 31.12.2021) and projection data for the scenarios and time horizons provided. It is noted that the entire sample (104 banks) had to submit starting point data, while projections had only to be submitted by a subset (41 banks).

The template and data structure resembled broadly the EBA EU-wide stress test data collection and data collections that the ECB tends to deploy for collecting additional information and data around the EU-wide stress test exercises, e.g. for quality assurance purposes.

Starting point data for both transition and physical risk included **expected loss** and **value measures (FV, notional)**, i.e. accounting parameters, as well as **unexpected loss** measures, i.e. prudential parameter like REA.

Projection data for both **transition and physical risk** was restricted **expected loss/fair value** measures only. While for the short-term tail risk and physical risk, a broad range of credit and provisioning parameter were collected, under the long-term strategic response (only credit risk), the required detail was limited to performing (S1+S2)/non-performing (S3) exposure buckets and PD pit, LGDpit and stock of provisions for those buckets for the years 2030, 2040 and 2050.

The ECB had defined the asset classes (portfolios) to be in scope (see also pp. 17 (transitional risk - credit), 19 (transitional risk-market) and 24, 31 (physical risk – credit) of the ECB methodology), and 22 industries as defined by NACE. The ECB collected in total around 60,000 data points for the bottom-up stress test.

Faced with the ECB data requirement, AFME asked its members a series of related questions which are discussed below.

Data bought externally specifically for this stress test

Around one third of banks stated that they had the data required already inhouse, mainly as the information and data had already been collected from providers / vendors under the existing climate-risk work. Missing counterparty emissions and EPC ratings were purchased by all of the remaining firms, alongside financial statements and revenues of counterparties and climate risk strategies and targets for corporate counterparties.

Data collected from clients and public information

Most members employed public information / official disclosure for their counterparts either online or company reports to collection GHG emissions, financial statements, income and climate risk strategies. Some banks used public sources (company reports, public register) also to retrieve

information on the EPC status. Only one bank noted that data on EPC and collateral location were also sourced directly from clients.

Proxy data used

All banks in the survey stated that they applied proxies for counterparties emissions and EPCs. Proxies were mainly needed to close data gaps across the sample or to update outdated information. Less often banks used proxies for location of collateral and counterparty revenue. It was noted that proxies were also used to allocate the fair value shock (market risk) to NACE codes and allocation of income to NACE codes.

With regard to GHG, e.g. CO2, proxies, which method was used?

Roughly half of the banks in the survey used sectoral averages based on PCAF methodology as GHG proxy, or assigning a standard percentile carbon intensity level according to a company's NACE grouping. In a number of cases banks filled year-gaps and structural data gaps by extrapolating emissions based revenues (on various levels of aggregation).

Which portfolio (input) data points (based on the stress test templates) proved to be the most difficult to derive/retrieve under which scenario and risk category, e.g. credit risk template, market risk etc?

As regards credit risk data, the majority of banks mentioned that the EPC data was the most challenging data point for the input stage, followed by GHG emissions.

It was also mentioned that providing net interest income, fees & commissions and volume exposure under module 2, metric one, was challenging due to structural issues of combining exposure data under a risk perspective with financial information from a finance perspective.

With reference to market risk, the most difficult input data to derive were allocation of Credit Spreads and Equity shocks in accordance with NACE sectors, which haven't been traditionally part of a market risk assessment.

Which projection (output) data points (based on the stress test templates) proved to be the most difficult to derive/retrieve under which scenario, e.g. credit risk template, market risk etc?

The vast majority of banks mentioned the most difficult output data to derive was PD pit, LGD pit and ECL projections under the long-term transition scenarios (credit risk). This was substantiated by firms saying that the very limited scenario parameters provided (3 data points) were insufficient for projecting credit risk parameters, the fact that internal models are not designed for long-term projections and the heightened level of uncertainty associated with long-term estimates, in particular under the hot house scenario. Also, members noted that the dynamic balance sheet introduced additional complexity, especially in the context of a bottom-up stress test. Finally, the projected distribution of EPCs appeared to be challenging. Members also highlighted physical risk projections as a focus for further development.

As regards templates, members noted that the IFRS 9 breakdown for the stress test templates was a burdensome activity. While the ECB stress test templates are very granular, requiring IFRS 9 split of credit projections, the BoE CBES templates are much more streamlined. It was acknowledged that the ECB template was more aligned to the ”standard” EU-wide stress test template, however, firms questioned as to whether if this is really necessary for a climate exploratory exercise.

Have you identified areas for focused data (quality) attention going forward?

All of the surveyed banks have identified areas for further data work in the future. The vast majority mentioned as most important areas for development:

- Emissions data – here in particular scope 3 – ;
- EPCs;
- Locations; and
- Granular NACE codes.

With respect to Scope 3 emissions members commented that Scope 3 emissions are difficult to measure and compare. The number for an individual name can widely diverge depending on the source of estimation (e.g. company reports, data vendors, own estimates, etc). In some instances this had led to wide deviations with ECB benchmarks as well. Also, emissions data for smaller counterparties is a focus point.

2.7 Module 2: Climate risk metrics methodology

2.7.1 Metric 1: Interest, fee and commission income from GHG intensive industries

In terms of members experience of this metric, they noted a number of challenges. Those challenges are often brought on by the nature of the systems in use, in particular accounting data, where structure and purpose are not always aligned with regulatory reporting.

Data:

- One member noted their internal database did not cover the full scope of incomes, which had to be expanded in some areas.
- The submission timeline was a challenge, i.e. between FINREP submission and Advanced Data Collection deadline.
- Further investigation on how revenue is attributed in FINREP and explore, if possible, to produce FINREP on a ‘bottom-up’ counterparty basis.
- There was limited availability of data on the structure of holding companies, which complicates the allocation of interest income, F&C and exposures associated with this income to economic sectors in line with the stress test requirements.
- Data was challenging to obtain as a result of some banks’ structure, for example, for one bank Transfer Pricing is the predominant driver of Net Fees & Commissions Income.
- While it was relatively simple to retrieve Revenues and Loans figures from the internal Systems of the Bank, the lack of a disclosed benchmark (i.e. FINREP Table) made the results hard to be verified/challenged.

NACE codes:

- Banks' own internal storing of NACE codes – in particular, the quality of underlying data for subsidiaries.
- Estimation of the share of exposures subject to NACE code which had to be reallocated in the case of holding companies.
- Data availability per NACE sector on gross interest income and gross fee and commission.

Inconsistencies with the methodological note and the Q&A process:

- Certain DQ checks appeared to compare the submission against Anacredit. However, reported data was based on FINREP definitions. Based on investigations of the flags, it appears variance stemmed to a large extent from different data definitions.
- Difficulties related to the correct interpretation of the Methodological Note which often seemed to contradict what reported in the FAQs and in the outcome of the automatic checks of the pre-validation tool, e.g. changing definitions.

2.7.2 Metric 2: Financed GHG emissions

Members experience of this metric, given relative lack of experience and knowledge in this context, meant the collection and check of punctual GHG data at counterparty level was particularly challenging and time-consuming. This was also compounded by a general lack of availability of counterparty CO2 emissions in the market currently.

Proxies: these were not always reliable, depending on the sector and for specific activities of the sector. In particular, proxy challenges were related to Scope 3 GHG emissions and Counterparty revenue.

Members noted their "actual" figures were collected manually on the web as it was not available from providers. For some sectors the sustainability report was not available for any of the 15 named counterparties (e.g. agriculture) while it was fully available for others (e. g. air transport).

A potential solution to increasing "actual" emissions data could be collaboration with the lines of business on whether emissions data could be sourced from clients directly. One member will also consider performing a root cause analysis for missing counterparty revenue data and implement controls to ensure this data is captured moving forward. Members will also consider formalizing proxies and fallbacks for missing revenue data.

Client corporate structure: When the client was a subsidiary, its carbon intensities could be very different to their parent's, which is the level at which companies report emissions. One member overcame this by scaling the client emissions according to their share of the parent's total revenue. Nonetheless they noted the method led to wide estimates. A more accurate measurement would be through converting company output to emissions using standard intensity factors. However, data disclosure proved a critical challenge for using this alternative methodology across the large number of sectors in scope for the exercise.

Scope 3 GHG emissions: It was noted this is highly sensitive to calculation methodologies and data availability leading to uncertainty. One member observed high variability in these estimates across and within NACEs.

As with metric 1 members noted there was a lack of information about the metric 2 guidelines, sometimes the messages conflicted (e.g. FAQ answer versus Methodological note) and there were ongoing changes to the definitions in the Q&A and pre-validation phase.

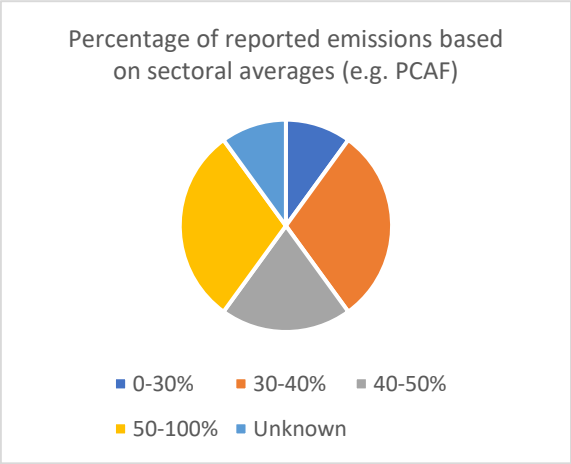

Figure 1: Breakdown of Members reported emissions based on sectoral averages.

2.8 Module 3: Bottom-up stress test methodology

Based on the scenarios provided by the ECB or national central banks, banks taking part in the bottom-up projections were asked to collate a stress test basis data set and also employ internal models to project the impact on counterparties and positions, respectively. In order to capture entire portfolios, extrapolations were allowed.

The prescriptions varied in respect of short-term tail risk and long-term strategic response (both transition risk) and physical risk.

2.8.1 Credit Risk

Transition risk

Short-term tail risk

The ECB had asked participating banks to employ their internal credit risk and provisioning models to assess the impact of climate risk, ideally on counterparty-level. Extrapolation were allowed to capture the entire portfolio.

The underlying credit risk parameters were supposed to be estimated in a way that appropriately captured the climate risk transmission channels for the given counterparty/sector.

The impairment calculation itself (within-year flows and stock of provision) followed the 2021 EU-wide stress test methodology. The calculations assumed a constant balance sheet.

Long-term strategic response

As for the long-term strategic response banks were asked to apply the same transmission assumptions leading to conservative credit risk parameters as under the short-term tail risk, however following a dynamic balance sheet approach.

Physical risk

The ECB had provided value added losses on sectoral level to support banks in their macro-economic assumptions in the context of heat/draught and flood maps in the context of flood events. Taking those provisions into consideration, banks were asked to project credit risk parameters using internal models under a static balance sheet assumption and a one-year horizon. Banks should assess the effect of insurances in the event of natural disasters and public disaster relief. The impairment calculations itself were to be carried out in accordance with the prescriptions of the EU-wide stress test methodology.

Counterparty affectedness

73% of banks developed or bought specific models to estimate the climate risk impact on their counterparties. In terms of model types, banks in our survey used a variety of approaches, e.g. linking GHG emission projections to a counterparts' financials, cost/revenue models, environmentally extended input-output models and also different affectedness indicators like carbon tax and technology.

Modelling risk mitigation

73% of banks developed or bought specific models to estimate the climate risk impact on their risk mitigation, e.g. insurance, derivatives and REE assessment. The main motivation by banks was to incorporate private insurance coverage and public schemes in the exposures in scope of the flood scenarios.

Most challenging parameter(s) to estimate

Regarding challenges with specific credit risk parameters, banks varied in their answers. However, deriving the risk parameters under the long-term scenario per counterparty and sector including the dynamic strategy appears also here an important area for development. In this context, banks shared the difficulties around:

- The amount of green investment per counterparty so that the scenario-conditional GHG emission pathway is plausible over time and across scenarios;
- EPC and growth rates by industry over the long-term horizon (dynamic balance sheet). Also, sectoral model estimation based on historical defaults by NACE for the geographies in the perimeter was mentioned;
- Translation of business strategies into scenario-relevant numbers and room for interpretation in the scenarios.

Members also mentioned the integration of the outcome of the specific climate-affectedness model into the stress test model framework as a challenge.

With respect to the templates, and being in agreement with the need for locked formulas, banks wondered whether more clarity could be provided to assist filling in.

Did you use the reallocation to a large extent?

The majority of banks didn't use reallocation (64%).

What were the main areas for amendments in your projection models?

Banks carried out a variety of different amendments, among which the most prominent is the integration of sectoral behaviour (also to reflect NACE sectoral differentiation) and climate-related risk drivers and the integration of micro- and macro effects.

Banks also mentioned that they simplified their models in order to utilise them given the limited data availability. Another field of amendment related to the inclusion of transmission channels for physical risk and LGD modelling. Also, the integration of exposure development under the strategic balance sheet evolution into models was mentioned.

Some banks applied expert judgement and internal benchmarking around the model outcome in order to support a consistent outcome.

What turned out to be the most challenging component(s) / parameter to project?

Banks found it most challenging to project PDs and LGDs under the long-term scenario, and here in particular the connection of macro and climate variables, Stage 3 Coverage increase as well as transmission channels and the EL forecast. The technical adaptation of the projection process due to the need of extend the projection horizon from the current horizon to 30 years was difficult.

Other areas of intense work include expanding scenario variables into sector price, demand & cost pass-through projections (e.g. oil price& volume projections, auto ICEs and EV sales and stock projections) and the ability of the internal stress test model to produce credit risk parameters at the required granularity (i.e. disaggregated by industrial sector/energy efficiency rating). Long-term projections of PD at sector/counterpart level were also mentioned.

Did you also use the long-term scenarios for internal steering?

The long-term scenarios were not used for internal steering purposes (64%), while 36% of banks in the survey found the scenarios helpful.

Were you able to derive the material risk drivers from the scenario set?

The majority of banks (82%) were able to derive material risk drivers for their models and portfolios from the ECB scenario variable set. Hereby, ECB variables were taken into account as a basis for the projections. However, most of the banks had to expand the variables to cover some geographies, and other variables needed, e.g. sectoral revenues and intermediate consumption.

Moreover, the projections also used other macroeconomics and sectoral variables, forecasted by the application of top-down models, which incorporated the information included in the ECB scenarios in order to ensure the consistency of the whole projections.

A limited number of banks (18%) found the ECB scenario variable set not helpful, and stated that deriving material risk drivers for a bottom-up rating framework was not feasible due to lack of scenario granularity and inconsistencies with the NGFS Delayed scenario.

Energy Performance Certificates (EPCs): what is the % distribution among actual data/modelled data/unavailable data?

With respect to EPC data, banks stated that the availability depends on geography. However, it can be inferred from bank's assessment that on average between 0-25% of EPC were available, around 65%-90% of EPC are modelled / proxied and between 0-10% are unavailable. In limited cases, 100% of EPCs were unknown, or up to 70% were actually available.

Levers: Would you change how banks can classify their strategies towards the different sectors(M3_TR_LT_CR_inputs)? If yes, please specify how.

In response to this question 55% of banks answered no, and 45% answered yes. Of the banks who would like to change how to classify their strategies. Banks suggested the following amendments:

- Show decades in the survey templates, as the strategy per sectors can change across decades;
- Increase granularity, as bank strategies are defined on counterparty level and take into account market capacity, "ESG Colour Coding", climate goals alignment and risk profile (credit risk appetite) as well as single sector and counterparty specificities; within the same sector different stances (e.g. support, reduce) are plausible depending on reliable of counterpart transition plans and especially on the most climate intensive counterparts, evaluating the value chain and the individual strategy for supporting the green transition;
- Amend the template to capture that the bank supports the clients in a sector where they will need to invest to succeed in their transition.

What could be improved in terms of the credit risk aspects?

(i) With regard to the stress test methodology

The uniform feedback received by banks was that the exercise might want to focus on medium to long-term transitional risk for the most impacted sectors.

In particular, banks stated that in order to improve the exercise following items might be considered:

- Reduction of metrics to be carried out;
- Concentrate on **medium to long-term scenario** projections, and keep the dynamic balance sheet or keep the number of scenarios / metrics but limit to static balance sheet;
- Introduce **materiality thresholds** and only test sectors that are mostly impacted by climate risk (focus on most material segments/portfolios), e.g. reduce the numbers of portfolios and simplify the data quality process (for instance, exposures on Corporate Secured portfolios not

Eligible to EPC could be considered as part of the "Corporate – Other Exposure", split by NACE Sector);

- Provide more details on how to model climate risks including macro and climate factors;
- Support the development of methods to impact company earnings, along with required assumptions and data inputs;
- **Limit projected data** to PD, LGD, LTV, etc. and remove IFRS9 breakdown.

It is noted that a small number of members stated that they would have applied the stress test to the whole balance sheet.

(ii) With regard to the internal modelling approach

The vast majority of banks identified room for further development with respect to their modelling and climate stress testing abilities. Concrete areas for work have been stated as follows:

- Internal model and stress test methodology, in particular scenario projections and driver identification and especially for long-term projections;
- Further work regarding physical risk projections beyond the limited scope of ECB Stress test;
- Modelling the insurance coverage in the physical risk scenarios;
- Develop expansion capabilities for scenario-conditional features (for example GHG emission pathway, sectoral value-added etc.), in order to derive more granular pathways and project counterpart-level and sectoral-level financials even more precisely; better capitalize on client emission trajectories instead of sectoral trends (e.g. via integration of business transition plans);
- Increase the internal model granularity - the outcome granularity of the internal modelling approach could be higher (single-name approach) and could be extended also to other type obligors (not only corporate segment);
- Better clarify in scenario assumptions the transmission mechanisms of physical risk in the short- and long-term (i.e. type and frequency of the extreme events);
- Built more robust dataset to refine calibration of credit risk parameters.

2.8.2 Market risk

Short-term tail risk only

The market risk projections were based on a fair value revaluation of market risk exposures that were in scope of the exercise, i.e. corporate bonds and stocks in the trading book (FVPL). Associated hedging positions were to be revalued separately, where associated hedging positions included all hedge-accounting portfolios designated to hedge positions measures at fair value.

The change in fair value was supposed to be broken down in the underlying main risk drivers, i.e. equity, credit spread, interest rates, commodities, FX movements and other.

Similar to credit risk estimates, banks were supposed to employ their internal valuation models based in the scenario parameters provided, most importantly to project the full effect of the instantaneous carbon price shock on the position value in scope.

Internal modelling of traded positions (development and purchase of specific models)

With regard to the CR&ER market risk impact the majority of respondents (90%) did not develop or buy specific carbon / climate affectedness models for traded positions. One of the respondents noted that the shocks provided by ECB were implemented using the standard stress test infrastructure, which was enriched with NACE codes, meaning no additional models were needed. Other members also noted that they leveraged their own internal climate scenario infrastructure to size impacts.

Modelling risk mitigation

In terms of CR/ER risk impact no members developed or bought models to estimate affectedness of traded risk mitigation, e.g. assessment of hedges, portfolio diversification.

Most challenging parameters/components to estimate (input information)

Members noted the most challenging component was the mapping of the trading book and financial market exposures to NACE sectors. It was difficult to break down both the impacts on P&L and the starting points, and the application of the shock by NACE for multi-underlying instruments (Funds, Index, baskets) required the implementation of specific rules and simplifications.

Members also considered that the hedging allocation and the identification of 1:1 hedges for the underlying counterparties were difficult to establish.

Main areas for amendments in your valuation / projection models

Surveyed banks felt across the piece that the information provided (parameters and well as methodology) limited meaningful analysis. Established valuation models could be employed – enriched with NACE sectors - but had to be adopted and simplified. However, banks had also to fall back on sensitivity analysis to derive results where a full revaluation of positions was not feasible.

Were you able to derive the material risk drivers from the scenario set?

64% of members were able to derive risk drivers from the scenario set. One member commented that while the rationale for the shocks to equity and corporate credit risk factors was understandable in the Market Risk scenario, it was unfortunately not the case for the interest rate and sovereign credit risk factors, despite the additional information provided by the ECB in the Q&A process. Put together, it was not straightforward to derive the material risk drivers from the scenario set. It was mentioned that expansion is needed to obtain the full set of parameters needed for those kind of exercises. In limited cases, all of relevant risk factors had to be derived (proxied).

Stress Test Methodology

Members had the following observations on ways to improve the stress testing methodology for market risk.

i) Market risk methodology

- Support for developing a new methodology note to reflect everything that is expected with this aspect of the exercise. The one used in this exercise did not allow to follow standard criteria for all the banks and each one had to establish their own proxies to stress test the

portfolios. Clarity and consistency in prescribed scope and methodology across asset classes and associated hedging positions would be welcome. Additionally, it was always necessary to go to the FAQs to understand what the expectations and methodology of the exercise were.

- Potentially extend to cover other relevant risk factors that might be impacted by climate stress. For instance, consider including sovereign spreads and commodities portfolios, and investigate impacts on counterparty risk, noting though that the time horizon of market risk and counterparty risk are fundamentally different than for climate risk.
- Review the stress shocks – in this exercise they were small and did not yield meaningful losses. Intuition of shock sizes across the different sectors were not necessarily as expected. Consideration could be given to collate the non-material sectors with the wider market and provide generic shocks for market risk.
- Shock time horizons could be defined in a more consistent way with the horizon of market crises. Shocks were provided for each asset class on a spot basis only, with no prescribed shocks for volatilities, and also no guidance as to consideration for other risk factors which often drive banks overall market risk (things like bond-cds basis and rates basis).
- The scenario could be refined to consider the liquidity horizon for market risks (e.g. a long holding period for asset class delta risks is usually not appropriate as the size of these risks means they can often be neutralised in a matter of days rather than months/years).

ii) Market risk modelling

Banks noted that the sectoral disaggregation of market risk position was the main focus within their modelling environment. Also, banks stated to work on more granular equity and credit spread shocks on issuer rather than sectoral level. Another field for expanding was to cover physical risk impact.

2.8.3 Operational and Reputational Risk

In contrast to the initial plans, the ECB didn't not require banks to quantify operational and reputational risk in the stress test. Information was collected via a questionnaire.

88% of members supported the approach adopted and 100% of members supported the change in approach to the questionnaire over the use case approach. However, 20% of firms did in any case calculate the initially requested use cases.

Reflecting on this, members appreciated the constructive change to a qualitative approach, which allowed them to focus their efforts for instance in the credit risk space. It was commented that had the case studies approach been pursued, the results would likely be highly hypothetical (the banks experienced very limited reputational incidents climate-related at this stage) and consequently of very limited added value relative to the time they took to do. In this context, banks also noted that the nature of reputational risk management (intrinsically driven, and incomparable across firms), a cross-sectional analysis like initially proposed by the ECB would have been inappropriate. It has been mentioned by firms that more work - also from the public sector side - needs to be spent developing the topic of reputational risks in the context of climate risk.

3. Scenarios

As commonly applied in climate risk assessments, the ECB bottom-up stress test differentiated between transitional risk and physical risk scenarios. An overview of the scenario parameter and other impacted variables was provided in tables A.2-A.5 of the methodology document.

80% of members did not consider the scenarios sufficiently specified for their firm, and that the scenario's package disclosed by the ECB could be completed. It was mentioned that drought scenarios relying only on trajectories of GVA by sectors left a lot of room to be developed differently by institutions. Banks stressed the need for much more precise scenarios, reflecting transition paths per sector associated with well-identified technical solutions and associated investment costs and articulated with European level target energy mix and transition policies.

In terms of what was missing/should be amended in the scenarios members noted:

- Scenarios had to be expanded to cover some geographies and variables not provided by the ECB/ NGFS.
- The sources of the input data used in the projections were integrated with supplemental variables.
- Recent historical MEVs are needed since models has dependency on lagged MEVs (mainly on sector level GVA).
- Better clarification is needed of the transmission mechanisms of physical risk in the long-term (i.e. type and frequency of the extreme events).
- Oil price could have been stated as producer price and not consumer end price. A fear factor, such as VIX , would have been useful, too.
- The sectoral evolution could have been enhanced with technological switches.
- Additional scenario information was needed for the trading/financial markets books.

Overall, scenarios that in our view are a core limitation to the exercise and the potential use of quantitative outcome: we would need much more precise scenarios, reflecting transition paths per sector associated with well-identified technical solutions and associated investment costs and articulated with European level target energy mix and transition policies.

Transitional risk

Under short-term transitional risk banks were requested to apply a scenario that describes a three-year disorderly transition of economies. In this scenario, a sharp increase in carbon price emissions triggers the adverse development. The scenario was meant to be severe but plausible in order to detect tail risks, and was inspired by the relevant scenario developed by the NGFS. As a baseline, banks were supposed to apply the December 2021 Eurosystem BMPE. The ECB provided a set of scenario parameter to allow banks to translate the scenarios effectively into their internal risk drivers. The short-term tail risk scenario was applied to credit and market risk alike under a constant balance sheet assumption.

Under the long-term assessment, three different scenarios based on NGFS scenarios were explored. Each scenario spans from the present day to 2050.

1) Orderly transition with smooth reduction in CO2 emissions
2) Disorderly transition where CO2 emissions don't decrease quickly enough until 2030
3) Hot house world with the associated physical risks

Banks were asked to assess the long-term scenarios in ten-year increments under a dynamic balance sheet assumption. Also under the long-term climate path, the ECB provided scenarios parameter to assists the transformation of the narrative into applicable variables.

It was noted that with regard to the assumptions, a number of these that were needed to feed into their stress testing framework were not readily available and had to be calculated / deducted / made:

(i) All assumptions for Euro area variables (GDP, inflation, investment, interest rates); and
(ii) Assumptions for some specific variables at a country level (business investment, household investment, household consumption, employment, core inflation).

Additional details regarding these variables would have been welcome. In some cases, the way assumptions were provided was also hard to interpret (in particular, the precise expression of assumptions for long-term scenarios in the first decade).

Were the following scenarios provided sufficiently specified for your firm?

Regarding the transitional (orderly) scenario, **70% of respondents** did assess them as **not sufficiently specified** to be used in the calculation. Regarding the transitional (disorderly) and hot-house scenario, **55% of respondents** did assess them as **not sufficiently specified** to be used in the calculation, respectively.

Regarding the comments / explanations, in order to better assess the transition risks (short-term and long-term), the users of the Orderly, Disorderly, Hot House World scenarios would benefit from additional comments explaining and quantifying the links between the main risk driver – i.e. the carbon tax – and the macroeconomic (GDP growth, inflation, gross value added in industries) and financial variables supplied by the ECB (short-term and long-term interest rates, equity prices, credit spreads, commercial and residential real estate prices, per quality label, etc). It would be useful to better understand the differences between geographies. In particular, inflation and interest rate paths were sometimes hard to interpret or understand, as well as the way the carbon tax should be implemented and used.

Other suggested comments and improvements:

- Additional support to understand how the initial long-term disorderly scenario was shortened to three years.
- To provide the same set of MEVs for orderly scenarios since the delta needs to be calculated to quantify the climate impact.
- For disorderly, include top level MEVs such as credit spread, equity price (SNP500) due to the model specification as well as the inclusion of price/output trends by sector, sectorial carbon emissions, and national GVA.
- For the short-term scenario it would have been useful to have also the sectorial GVA.
- Oil price should have been stated as producer price and not consumer end price. A fear factor, such as VIX would have been useful.
- Provide clear linkage with NGFS scenarios, inputs in levels instead of changes.
- Enhancing sectoral evolution and technological switches.

One member noted they sourced other variables from internal macroeconomic models and NGFS Phase II dataset (the additional sourced variables were aligned with ECB provided scenario), and included among others, energy and electricity prices and demands (e.g. oil, gas, coal, renewables, nuclear, solar, etc.), carbon tax projections, macroeconomic variables, investments in energy and electricity supply.

Physical risk

Under physical risk banks were required to assess the effect of a **severe drought and heatwave** and a **large flood** on their portfolios. The hazards had been chosen as the most relevant disasters for Europe. In order to translate the hazard into banks risk parameter, the ECB provided value-added growth per sectors on EU country level for the drought and heat risk and house price shocks and commercial real estate price shocks for the flood scenario. As mentioned previously banks had to assume a static balance sheet for a one-year horizon.

Was the physical risk (drought) provided sufficiently specified for your firm?

With regard to this scenario it was noted that the drought & heat scenario narrative was not detailed enough to clarify if and how it would trigger natural disaster relief schemes.

It was also suggested that top level GDP and other top level MEVs such as credit spread, equity price (SNP500) due to the model specification could have been included as well as historical GVA in prior quarters. For the one-year scenario a quarterly frequency could also be considered.

Was the physical risk (flood) provided sufficiently specified for your firm?

It was noted that the narrative was not detailed enough to clarify if and how it would trigger natural disaster relief schemes. It was also not clear what the shock on the real estate values integrated (re-construction costs, impossibility of re-construction for some assets, insurance premiums increase etc.). A quarterly frequency could also be considered.

4. Key Learnings

4.1 Key insights

Members have learnt a lot from the exercise and have identified a number of areas to work on to improve and build their stress testing capacity going forward as set out below.

Modelling approaches: As a result of this exercise members have developed modelling approaches to integrate client level specificities and long-term perspective in a dynamic balance sheet. In turn this was useful to drive discussions around the need to finance the transition. It has also helped members to build models and understand where modelling needs to be enhanced, e.g. incorporation of carbon price/industry/LGD sensitivity, long-term balance sheet, Loan-To-Value, insurance & parent. It will help to assess which features are needed for long-term credit risk models. It was also an opportunity to gain familiarity with granular sectorial models.

Data gaps: As also highlighted by the ECB, a fundamental aspect of the exercise was to identify data gaps. Members note that this has been useful to understand where they have deficiencies and need to establish proxies. Key insights were gained into banks' data capabilities in relation to EPCs, NACE, GHG emissions. One member highlighted the need to centralise both data incorporation into their systems and data quality review, so the data can be correctly used to assess quantitatively and to integrate CR in the risk management.

Climate scenarios: Members gained insight on how to design climate scenario analysis and build projections.

Firm awareness of climate risks: Several members noted that the exercise helped them to bring together teams internally, raise awareness and coordinate better, e.g. determining appropriate ownership on climate strategy development and balance sheet projection. It was also mentioned that this exercise helped identify where a climate risk culture needed to be improved. Module 1 was useful in this respect for a diagnosis and awareness of internal preparedness.

4.2 Initial conclusions for Supervisory Authorities and Regulators

Members note there are still many challenges for supervisors (scenarios, methodologies) and for banks (data quality, modelling approaches, representativeness of NACE coverage) which will take time to address.

At this stage we would note the quantitative results and their benchmarks are less relevant given the challenges and issues usefully identified by the stress test. Even where there is a detailed methodology, if untested inputs such as scope 3 emissions and long-term horizons are included in the projections, the result is potentially an understatement of climate risk.

Consequently, given the current immature nature of the measurement methods in industry and public authorities, the results of this exercise are not sound enough for decision or policy making in relation to capital treatment. Rather, the focus should be – as rightly recognised by the ECB – directed towards using the qualitative conclusions, focused on building banks' stress testing capacity. With regard to data gaps, this should consider how to help banks to improve, standardise and better coordinate data collection. This should include external data methodology (notably GHG emissions).

Aside from this work needs to continue with regard to models and integration in bank processes and industry cooperation.

Future Climate Risk stress testing exercises

Members were surveyed on how often the Climate Risk stress tests should occur, and 10 out of 11 members suggested every two years. One member also suggested this should alternate between the EBA stress tests (and definitely not concurrently with the regular EBA stress tests). It would be useful if the ECB and the EBA could already set out how they will coordinate future climate risk stress testing exercises, e.g. for 2024. Another suggestion for future exercises was to focus on a specific risk type, e.g. Credit Risk, every few years to ensure banks have sufficient time to fully enhance their data/models/controls to cater for regulatory requirements, per the template.

Interaction with other supervisory initiatives of the ECB

Generally members thought this interacted well with the other initiatives and complemented undertakings such as the ECB expectations on C&E risks.

One area members noted could benefit from more clarity however, is how it informs the thematic review. While climate scenario analysis and stress testing are in their infancy as evidenced by the stress exercise, the thematic review assumes more progress has been made. Module 1 was also somewhat duplicative of the thematic review which was due in mid-March and this could have benefited from some consolidation.

4.3 Areas for future industry collaboration

100% of respondents agreed there could be more industry collaboration to drive consistency and reduce the burden of future exercises, e.g. with regard to validation.

In this respect members considered the following areas as best suited for industry collaboration:

Data:

- Proxy data – for instance, where data is missing, there could be a single standardised proxy that all firms use, rather than leaving firms to develop their own proxy, to support peer-comparisons & trend analysis.
- Public data.
- GHG data on common counterparties.
- Developing an open source for NACE, Emissions & EPC data.
- Data quality assurance process.

Methodology:

- A forum to discuss the interpretation of ECB guidance and application of methods, e.g. organise workshops to discuss modelling approaches with the intention to create industry standards.
- Enhancing the scenarios.

4.4 Potential improvements for future exercises

Improvements to operational challenge

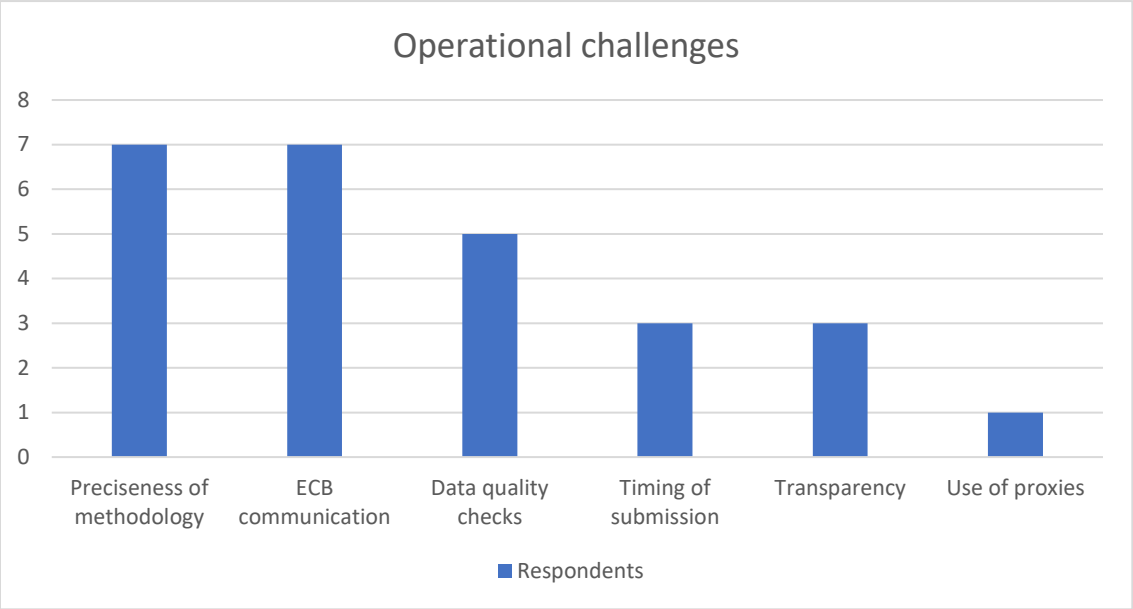

Figure 2: Overview of Operational Challenges

In terms of operational challenges members identified preciseness of methodology, ECB Communication and Timing and Data Quality Checks as the main areas which could be improved upon in future exercises. Suggestions for improvements (which will be subject to further review) are set out below.

Preciseness of Methodology

- Consistency between the methodological note and the FAQs.
- In some areas more detailed methodology to support precision of submissions would be welcome, e.g. FAQ's indicated for Module 2_Metric 1, the domestic country should be included for the top 5 countries, however this was not mentioned at all in the Methodological Note.
- Clarity on starting parameters, CO2 emission collation and the parent approach (Module 2_Metric2) were also noted.
- However, in other areas members identified over-prescription of methodology, e.g. granular IFRS9 breakdown for credit risk; exposures, revenue and CO2 consolidation data at counterparty subsidiary level.
- Less reliance on Q&A for guidance and more defined instructions at the outset of the exercise.
- Consistency between the FAQs and the pre-validation tool checks, e.g. inclusion of off-balance sheet exposures.
- Clarity on methodology for parent approach.
- Introduce a path generator as is available in other supervisory exercises.

ECB Communication:

- Flexibility for unforeseen issues arising.
- Timely clarification on the methodology (ideally not through the FAQ process).

- Individual follow-up with banks following the distribution of their results.
- Clear communication and transparency on the scoring process (quantitative figures have been used in the scoring system while ECB stated that the assessment will be qualitative (quality of models, data and process)).
- More generally envisaging an active role for the JSTs in providing clarifications to participating institutions in terms of process and methodology together with taking into account bank-specificities. This can help to ensure effective dialogue between banks and ECB central teams on flags and observations.

Timing

- Full submission of the projections in the FDC and granting more time between publication of the scenarios and submission of the projections.
- Open the FAQ process earlier to allow interpretation of responses and facilitation of changes in the downstream processes.
- No overlap with ICAAP and the horizonal review.

Data Quality Checks

- Clearer comments on data quality checks in the star portal and ensuring relevance (e.g. highlighting comparison to a different scope in FINREP)
- Checks with Anacredit were not appropriate for the exercise.
- Introduce materiality to the red flag scheme in the Quality Assurance process.
- Allow banks to raise issues through the JST rather than a centralised communication team.
- In line with this being a learning exercise, provide transparency over the controls applied to assess quality control to help banks in their own review and data quality process.

The following suggestions represent the initial key changes members would advise for future exercises from a Scope and Methodology perspective, which we will be considering in the course of further analysis.

In terms of scope, members considered areas for consideration in future exercises should consider: countries for the long-term scenario; market risk; IRBBB; unexpected losses; IFRS9 breakdown for credit risk; and transition risk in the short-term analysis.

With regard to methodology, members noted that it would be helpful for the ECB to include the "best in class" methodologies from this exercise so all the firms can better reflect their risk exposure. More guidance on long-term scenario analysis and business strategy assumptions would also be welcome. More generally a more structured framework for conducting scenario analysis would be appreciated. It was noted that the 3-year horizon and the materiality of acute physical impacts could also be reviewed.

5. Conclusion

As the results of this survey show, climate risk analytics and climate risk data is still in its infancy. Harmonised, region-wide scenario exercises and stress tests are therefore important tools to facilitate advancement in the field, but also to create the possibility to learn. We therefore welcome that the results of this exercise are not directly linked to capital requirements. AFME will continue to engage

and facilitate the development of the tests going forward to ensure a meaningful transition of the European banking system.

There is still much work to do to close data gaps, refine scope and scenarios and of course, understand the mechanics of transmission channels into banks' balance sheets and portfolios. It will take more time before banks are able to quantify climate risks more reliably and to then introduce supervisory or prudential measures if needed.

In order to support the development of climate risk analytics and stress tests, AFME's member banks will continue to take action to address data and analytical shortcomings, both at global and European level. This survey already identifies some areas where banks can potentially work together or with the ECB to find some common solutions. Nonetheless, banks' success in upgrading their data capabilities will also rely on corporate disclosure, which is in the pipeline through the Corporate Sustainability Reporting Directive (CSRD) and internationally through the International Sustainability Standards Board (ISSB). Aside from this our members are also currently in the process of defining data collection templates, including a suitable data processing framework for corporates and SMEs, which aims at closing client information gaps in a coordinated fashion across leading EU and global banks.

AFME will continue to review the results of the exercise closely with members and will provide further analysis later in 2022.