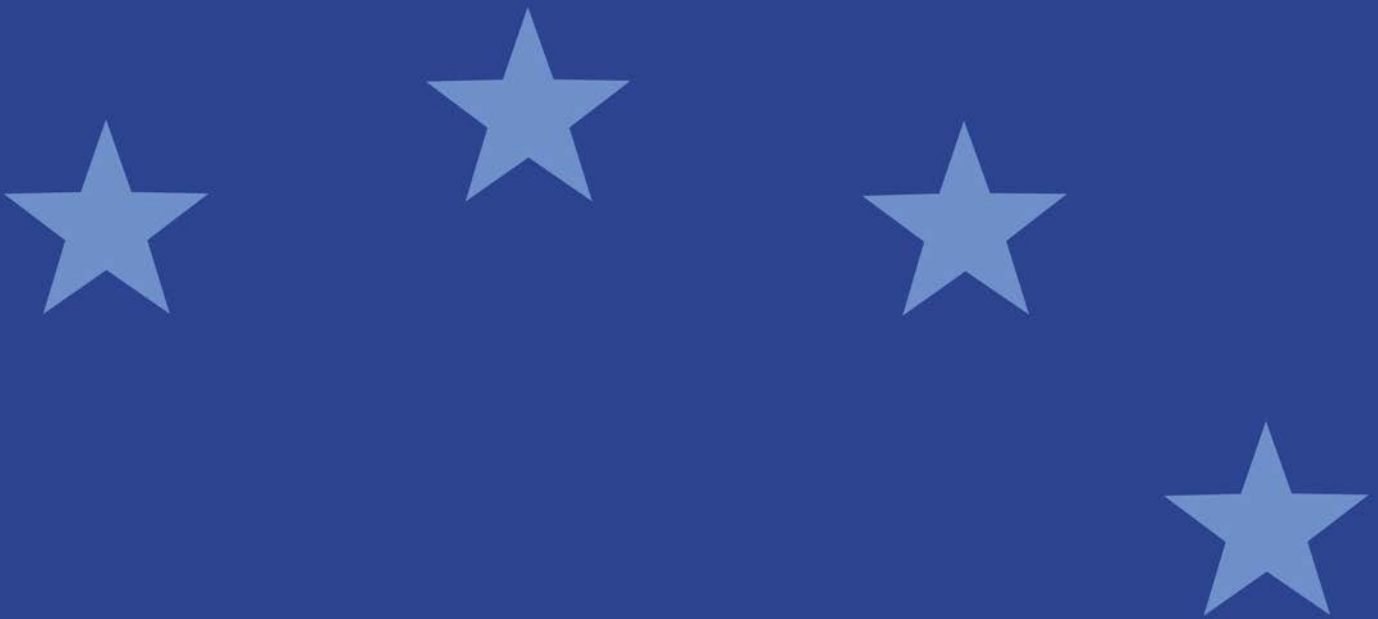




European Securities and  
Markets Authority

# Call for evidence

**An approach to Climate Risk Stress Testing of Central Counterparties**





## Responding to this paper

ESMA invites comments on all matters in this paper. Comments are most helpful if they:

- (1) respond to the question stated;
- (2) indicate the specific question to which the comment relates;
- (3) contain a clear rationale; and
- (4) describe any alternatives ESMA should consider.

ESMA will consider all comments received by **25 April 2022**.

All contributions should be submitted online at [www.esma.europa.eu](http://www.esma.europa.eu) under the heading 'Your input - Consultations'.

### Publication of responses

All contributions received will be published following the close of the consultation, unless you request otherwise. Please clearly and prominently indicate in your submission any part you do not wish to be publicly disclosed. A standard confidentiality statement in an email message will not be treated as a request for non-disclosure. A confidential response may be requested from us in accordance with ESMA's rules on access to documents. We may consult you if we receive such a request. Any decision we make not to disclose the response is reviewable by ESMA's Board of Appeal and the European Ombudsman.

In all cases, responses will be processed by ESMA staff with the possible involvement of experts seconded by NCAs and/or the ECB.

### Data protection

Information on data protection can be found at [www.esma.europa.eu](http://www.esma.europa.eu) under the heading '[Data protection](#)'.

### Who should read this paper?

All interested stakeholders are invited to respond to this Call for evidence paper. In particular, responses are sought from central counterparties (CCPs) and their clearing members.

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## Abbreviations

BCP	Business Continuity Planning
CCP	Central Counterparty
CPMI	Committee on Payments and Market Infrastructures
EBA	European Banking Authority
EC	European Commission
ECB	European Central Bank
EIOPA	European Insurance and Occupational Pensions Authority
EMIR	European Market Infrastructure Regulation
ESA	European Supervisory Authority
ESMA	European Securities and Markets Authority
ESG	Environmental, Social and Governance
ESRB	European Systemic Risk Board
NCA	National Competent Authority
NGFS	Network for Greening the Financial System
RTS	Regulatory Technical Standards
SSM	Single Supervisory Mechanism

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# 1 Executive Summary

Efforts to integrate environmental factors into risk frameworks to promote sustainable finance are at the forefront of many practitioners' agendas in the financial industry as well as policy makers. More and more corporates and financial market players make public commitments to set net zero targets. The monitoring and management of financial risks that stem from environmental factors, such as climate change, is growing in importance.

The assessment of climate risk within CCPs is still in its infancy at the level of individual CCPs, and to our knowledge, no cross-CCP climate stress test has been carried out to this date in any jurisdiction.

Following the 2020 review of its founding Regulation, ESMA is mandated to consider environmental, social and governance (ESG) related factors in all of ESMA's tasks and powers. More specifically, ESMA shall integrate potential environment related risks in its stress testing regimes and methodologies for assessing the effect of adverse scenarios on the positions of participants in financial markets.

In this context, ESMA has developed an approach on climate risk stress testing of central counterparties (CCPs). ESMA has identified four different elements of climate risk that may adversely impact CCPs. The approach takes into account the objectives of the European Commission (EC), set out in its July 2021 *Strategy for Financing the Transition to a Sustainable Economy*, to develop coherent and relevant methodologies and scenarios to quantify sustainability risks and to stress test the resilience of the financial system, covering relevant financial sectors.<sup>1</sup>

This Call for evidence paper contains ESMA's approach and seeks input from stakeholders.

The Call for evidence paper has several goals:

- building a robust mapping of the specific risks stemming from climate change that are relevant to CCPs,
- understanding how these risks may be assessed, and what limits need to be acknowledged,
- taking stock of the efforts ongoing at CCPs,
- contributing to market participants' awareness of the relevance of climate risks to CCPs.

The overall objective is to proactively contribute to the assessment of the resilience of CCPs to adverse market developments, consistent with EMIR article 24a(7b). The information gathered through this Call for evidence will be used as building blocks of a future EU-wide CCP Climate Stress Test.

## 2 Background and legal mandate

### 2.1 ESMA's EU-wide CCP stress tests

1. Since 2016, ESMA has been developing and enhancing its methodologies for EU-wide CCP stress tests. In doing so, it built components addressing the following categories of risk.

- The first stress test [13] introduced credit risk, i.e. the risk from clearing exposures in the event of the default of one or several clearing members.
- The second stress test [14] refined the credit risk component with internally consistent scenarios and added liquidity risk, i.e., the risk that resources may be available to the CCP with a delay.
- The third stress test [15] introduced concentration risk, which is the increased cost of liquidating a portfolio where the size of the defaulter's positions causes issues. In addition to these efforts, the knock-on impact effects and interconnectedness of CCPs were assessed.
- The fourth stress test [16] will introduce a study of operational risk, identifying events affecting third-party entities on which CCPs rely to provide their services.

2. This stream of work has been instrumental in surveying and assessing a broad spectrum of financial risks affecting CCPs or stemming from them. Further detail on this is available in Annex I of this paper.

3. ESMA is now initiating an effort to explore the matter of climate risks in the context of CCP stress tests. As is the case for the other CCP stress tests carried out by ESMA, this work will assess the joint risk of several CCPs and investigate market interconnections.

4. The study of an approach to climate risk stress testing of CCPs is conducted in parallel to the fourth stress test and a climate risk scenario may at a later stage be introduced either as a new component (or set of components) of the CCP stress test or as a separate assessment. At the present time, given the innovative nature of the climate stress test for CCPs, the first step is to issue this Call for evidence to ensure a thorough analysis of the specificities of climate risks for CCPs.

5. One aspect of CCP stress tests worth noting at the onset of this paper is that a CCP stress test analyses the consequences of a given scenario (e.g. default of one or several clearing members and a specific change in prices of financial instruments), but it does not compute precisely a probability of occurrence. The events modelled must be "extreme but plausible", as

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<sup>1</sup> EC [Strategy](#), p. 13.

per Article 30 of the Regulatory Technical Standards under EMIR (RTS). The assessment of which event is more likely to occur than another is out of the scope of this approach.

6. In the same spirit, CCP climate stress testing will look into the consequences of climate change related events or trends, and will ensure that the events analysed are extreme but plausible. It will not encompass an assessment of the probability of a certain chain of events materialising.

## 2.2 Climate risks

7. Although climate risks remain a relatively new concept compared to other, more traditional sources of financial risk, several central banks and authorities have conducted pioneering work in this area for several years. This led to the establishment in December 2017 of the Central Banks and Supervisors Network for Greening the Financial System (NGFS), which has since become the main reference for climate risk analysis in the financial sector.

8. In light of the revisions to the ESMA Regulation (see [18] and Box 2 below), ESMA joined the NGFS as a full member in late 2020. As regards its prudential mandate, the NGFS membership is instrumental to ESMA staff building on existing expertise in the area of climate risks, including through workshops and outreach sessions, facilitating coordination with other public authorities in the area of climate stress tests, and seeking maximum alignment with existing international standards, including definitions, methodologies and scenario design.

9. This Call for evidence focuses on climate risks rather than the broader concept of environmental risks. In its first comprehensive report [7], the NGFS defined environmental risks as financial risks (credit, market, operational and legal risks, etc.) posed by the exposure of financial firms and/or the financial sector to activities that may potentially cause or be affected by environmental degradation (such as air pollution, water pollution and scarcity of fresh water, land contamination, reduced biodiversity and deforestation).

10. The NGFS report further highlights the need to focus in priority on climate risks, given the need for a radical shift in resource allocation and the potential impact of actions taken today over many years in the future. Beyond climate, there is only a nascent understanding of the possible interactions between other environmental issues and financial risks. For example, the potential linkages between biodiversity losses and financial stability are now just beginning to be explored.<sup>2</sup> From a CCP point of view, the focus on climate risks allows for a more calibrated effort and response to the growing sense of urgency around climate change and increasing concerns about the potential impact of climate risks.

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<sup>2</sup> See for example NGFS, Biodiversity and financial stability: Exploring the case for action, Occasional Paper and Banque de France, Biodiversity loss and financial stability: a new frontier for central banks and financial supervisors?, Banque de France Bulletin no. 237, Article 7, 20 October 2021.



11. Several definitions of climate risks exist, including a general definition of the Intergovernmental Panel on Climate Change (IPCC) and a financial sector focused definition of the NGFS.<sup>3</sup> Relative with the IPCC definition in Box 1, the NGFS definition usefully narrows the scope to the financial sector, which makes it more directly relevant to this call for evidence. In its Guide for Supervisors (see [17]), the NGFS distinguishes between two categories of climate related risk sources:

12. Physical risks are defined as financial risks resulting from “increasing severity and frequency of extreme climate change-related weather events (such as heat waves, droughts, landslides, floods, wildfires and storms), as well as longer-term progressive shifts in the climate (such as ocean acidification, rising sea levels and average temperatures)”.<sup>4</sup>

13. Transition risks are defined as financial risks resulting from “the process of adjustment towards a lower-carbon and more circular economy, prompted, for example, by changes in climate and environmental policy, technology or market sentiment”.

**Box 1. IPCC definition of risk in the context of climate change**

*The potential for adverse consequences for human or ecological systems, recognising the diversity of values and objectives associated with such systems. In the context of climate change, risks can arise from potential impacts of climate change as well as human responses to climate change. Relevant adverse consequences include those on lives, livelihoods, health and wellbeing, economic, social and cultural assets and investments, infrastructure, services (including ecosystem services), ecosystems and species.*

*In the context of climate change impacts, risks result from dynamic interactions between climate-related hazards with the exposure and vulnerability of the affected human or ecological system to the hazards. Hazards, exposure and vulnerability may each be subject to uncertainty in terms of magnitude and likelihood of occurrence, and each may change over time and space due to socio-economic changes and human decision-making (...).*

*In the context of climate change responses, risks result from the potential for such responses not achieving the intended objective(s), or from potential trade-offs with, or negative side effects on, other societal objectives, such as the Sustainable Development Goals (...). Risks can arise for example from uncertainty in implementation, effectiveness or outcomes of climate policy, climate-related investments, technology development or adoption, and system transitions.*

14. Although it does not provide for a definition of climate risks, it is important to highlight the fundamental role of the EU Taxonomy Regulation in this context.<sup>5</sup> The EU Taxonomy is a classification system that (1) establishes a list of activities that are considered as substantially contributing to each of the EU’s main environmental objectives and (2) sets the technical criteria for being ‘environmentally sustainable’. It establishes six environmental objectives,

<sup>3</sup> IPCC, The concept of risk in the IPCC Sixth Assessment Report: a summary of cross-working group discussions, 4 September 2020

<sup>4</sup> NGFS. Guide for Supervisors Integrating climate-related and environmental risks into prudential supervision. May 2020

<sup>5</sup> [https://ec.europa.eu/info/law/sustainable-finance-taxonomy-regulation-eu-2020-852\\_en](https://ec.europa.eu/info/law/sustainable-finance-taxonomy-regulation-eu-2020-852_en)

including climate change mitigation and climate change adaptation. As such, it can be useful in the context of climate risk assessments to map the financial entities' exposures to more or less environmentally sustainable activities.

## 2.3 Review of existing climate stress tests

15. Following Article 23(2) of its founding Regulation, ESMA “shall take fully into account the relevant international approaches when developing the criteria for the identification and measurement of systemic risk posed by financial market participants”. In line with this, ESMA has taken stock of relevant climate-related stress testing approaches developed among relevant international and national bodies.

16. Climate-scenario based analysis such as climate stress tests already benefits from the experience of many central banks and supervisors, including most prominently the Bank of England, Banque de France, De Nederlandsche Bank, the European Central Bank (ECB), the European Systemic Risk Board (ESRB), the European Banking Authority (EBA), and the European Insurance and Occupational Pensions Authority (EIOPA). This call for evidence aims to leverage on their approaches, including their use of scenarios, as a starting point of a broader information gathering, including from industry practitioners with a specific interest in CCPs.

17. The NGFS classifies the impact of different possible climate change pathways in four dimensions: financial institution-specific risks, financial system-wide risks, macroeconomic risks and risks to central banks' own balance sheets. In the context of ESMA's EU-wide CCP stress tests, which scope includes CCPs and their role in the EU financial system, the focus of this Call for evidence Paper will be mainly on the first NGFS dimension, and to a lesser extent on the second one.

18. The vast majority of climate-scenario based analyses undertaken so far have focused on banks and insurance companies.<sup>6</sup> Climate-scenario based analyses for these entities incorporate several factors, including the systemically relevant size of entities within these sectors, the share of these sectors in total credit intermediation, the relevance of climate specific features to some of their activities. In Europe, the early work carried out by several central banks also helped to raise awareness and build expertise within banking and insurance institutions, contributing to the development of climate risk management tools, including scenario-based analysis, within private financial institutions.<sup>7</sup>

19. The European Supervisory Authorities (ESAs) also started work on climate risks in relation to the financial sector as part of their broader sustainable finance agenda. ESMA published in March 2021 a first climate scenario analysis of the EU investment fund industry (see [19]). EBA published in May 2021 the results of its first *EU-wide pilot exercise on climate risk* (see

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<sup>6</sup> See for example US Financial Stability Oversight Council, Report on climate-related financial risk, Box L, 2021.

<sup>7</sup> See Garp Risk Institute, Third Annual Global Survey of Climate Risk management at Financial Firms, 2021.

[20]) in the EU banking sector, and EIOPA published in December 2020 a *Sensitivity analysis of climate-change related transition risks* in the EU insurance sector (see [21]).

20. These top-down assessments carry important lessons for climate risk analysis in the EU financial sector including on methodologies and data availability. According to EBA, climate risk assessments require a broader set of information in comparison to standard risk assessment tools, but limited data availability and reliability can affect the comparability of the results. EIOPA further highlights that data limitations particularly hamper the analysis for some sectors (agriculture and real-estate). Moreover, these exercises also show that climate scenario analysis involves fundamental choices in terms of methodologies and estimation approach, which can be based on very different assumptions and have a high impact on the resulting calculations.

21. The ECB and ESRB also carried out climate-scenario based analyses of the EU financial system. The joint ECB-ESRB report on climate-related risk and financial stability (see [22] published in July 2021) explored the impact of climate risks on EU banks, insurers and investment funds using scenarios developed by the NGFS. It highlighted recent progress made in climate stress test methodologies, which increasingly cover physical and transition risks, as well as the use of increasingly granular (firm-level and security-level) data, despite constraints that are specific to banks insurance companies and funds. One conclusion of particular relevance for CCPs from a methodological perspective is the need for new models that are better suited to the dynamic response of financial institutions to climate-related shocks.

22. The ECB also published in September 2021 the results of its first *Economy-wide climate stress tests* (see [23]). This exercise had a different scope as it aimed to assess the potential impact of climate-related shocks on the non-financial corporate sector, in addition to banks. As such, it is a particularly data-intensive exercise allowing for the calculation of economy-wide estimates of the “cost of inaction” in addition to estimated losses at firm and sector level from multiple shocks. This report was followed in October 2021 by a methodology guide from the Single Supervisory Mechanism (SSM) on the banking supervisory side.<sup>8</sup> Both will serve as input to the 2022 supervisory climate stress test of the SSM.

23. Despite these advancements, the field of climate scenario-based analysis remains relatively new, and progress on the methodologies is still ongoing. Work on methodologies, modelling and scenarios continues, including at the NGFS and the ESRB with ESMA among the contributors (including for coordination purposes). Meanwhile, public authorities, including ESMA, are actively tackling the climate-related data limitations acknowledged in existing exercises.

24. One noticeable aspect that comes out of this short review of existing and on-going climate stress test efforts is that CCPs are, so far, not included in the scope of the research activities. The specificities of CCPs require a specific analysis and a certain degree of adaptation of the

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<sup>8</sup> <https://www.bankingsupervision.europa.eu/ecb/pub/pdf/ssm.climateriskstresstest2021-a4de107198.en.pdf>

approaches developed for other financial institutions. Section 3 of this paper elaborates on these specific nature of CCPs and how methodologies should take this into account.

## 2.4 Mandate

25. The development of an approach to climate risk stress testing for CCPs would be covered by the ESMA Regulation [18], which embeds a duty to take into account relevant climate risks (See Box 2).

26. This effort should also be seen in the broader context of ESMA's work on sustainable finance, which is further detailed in Annex II of this paper.

27. More specifically, ESMA has decided to consult market participants on the overall approach of a climate risk stress testing framework for CCPs for several reasons.

28. First, as discussed above, there has been little supervisory or other analytical work devoted towards integration of environmental risks into CCP stress testing arrangements, despite the impact of climate risks on CCPs being mentioned in [6] and [24]. Although ESMA has used its own in-house expertise on CCPs and sustainable finance, it recognizes that stakeholder views at this current and critical juncture can be of benefit. Second, while not strictly required under ESMA's supervisory mandate, the decision to consult market participants aims to be aligned with ESMA's other consultative activities required under the ESMA Regulation (e.g. Articles 10, 15, 16, and 16a relating to Regulatory and Implementing Technical Standards, Guidelines/Recommendations, and Opinions). Lastly, the decision to consult market participants at this stage reflects ESMA's objective to proactively develop its CCP stress test by taking into account new types of risk in order to contribute to financial stability and enhance supervisory convergence, in line with Article 23(1) of the ESMA Regulation, as well as Article 32, copied below.

### **Box 2: Environmental risks in ESMA Regulation (EU) No 1095/2010**

#### **Article 32. Assessment of market developments, including stress tests**

*2. The Authority shall initiate and coordinate Union-wide assessments of the resilience of financial market participants to adverse market developments. To that end, it shall develop:*

*(a) common methodologies for assessing the effect of economic scenarios on the financial position of a financial market participant, taking into account inter alia risks stemming from adverse environmental developments*

*[...]*

*(d) common methodologies for assessing the effect of environmental risks on the financial stability of financial market participants.*

29. ESMA coordinates and cooperates with other ESAs in the area of climate stress tests, as suggested in a proposal of the EC<sup>9</sup> for amending Directive 2013/36/EU (Box 3).

**Box 3** – Proposal for a Directive of the European Parliament and of the Council amending Directive 2013/36/EU as regards supervisory powers, sanctions, third-country branches, and environmental, social and governance risks, and amending Directive 2014/59/EU

*Art. 91d – (25) - EBA, EIOPA and ESMA shall, through the Joint Committee referred to in Article 54 of Regulations (EU) No 1093/2010, (EU) No 1094/2010 and (EU) No 1095/2010, develop guidelines to ensure that consistency, long-term considerations and common standards for assessment methodologies are integrated into the stress testing of environmental, social and governance risks. Stress testing of environmental, social and governance risks by competent authorities should start with climate-related factors. EBA, EIOPA and ESMA shall, through the Joint Committee referred to in Article 54 of Regulations (EU) No 1093/2010, (EU) No 1094/2010 and (EU) No 1095/2010, explore how social and governance related risks can be integrated into stress testing.*

## 2.5 Set up of the Call for evidence

30. This chapter reflects a review of existing literature on climate risk for financial entities, with a view to identify differences, convergences, and to see which risks could be relevant to CCPs.

31. Based on this review, ESMA developed a classification of climate risks with four pillars. These pillars are used to structure this Call for evidence paper in the following chapters. The classification is not set in stone and respondents are asked to comment on the relevance and content of the different pillars of this classification.

32. The Call for evidence paper is a key step towards building a Climate Stress Test for CCPs. It allows ESMA to engage with market participants early in the process of developing a stress test approach for CCPs, in order to ensure that all relevant aspects are captured.

33. This Call for evidence paper has several objectives. First, since it is the first time that such cross-CCP initiative<sup>10</sup> is undertaken, it will promote the awareness among market participants of the climate-related risks that may affect CCPs or that could spread to the market from CCPs. By defining a mapping of which risks are relevant, it will help emphasising that climate risks are not only long-dated phenomena but that they may also relate to events occurring in a matter of days, making them relevant to CCPs.

34. It will explore how to model climate risks for CCPs, build a robust mapping, identify limitations, and present existing practices within CCPs, which ESMA should be aware of when building its EU-wide CCP Climate Stress Tests. The remainder of this paper starts with the

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<sup>9</sup> [Proposal for a Directive amending Directive 2013/36/EU as regards supervisory powers, sanctions, third-country branches, and environmental, social and governance risks, and amending Directive 2014/59/EU \(europa.eu\)](#)

<sup>10</sup> Individual CCPs may have already begun this effort, and the last part of this Call for evidence aims at establishing an inventory of these developments

definition of the key risks posed by climate change to CCPs and proposes a mapping of these risks into four pillars of climate risk for CCPs. Then, for each of the four pillars, the paper proposes measures for assessing these risks, requesting input on how to best carry out this assessment for an EU-wide CCP stress test. Finally, it calls for information about any current practices that CCPs have in place to address climate risk.

35. The participation of the ECB/Eurosystem in the establishment of this Call for evidence has enabled the construction of the comprehensive set of questions to conduct a stock taking of current and planned practices of individual CCPs which make up section 5 of this paper.

### **3 Defining climate risks affecting CCPs**

#### **3.1 Scoping of the exercise**

36. A first element in framing the scope of climate risk stress testing of CCPs concerns the need for including climate pathways and climate related macroeconomic scenarios. Depending on the purpose or scope of a stress test exercise for financial institutions, climate scenarios may explore various policy and technology mixes and associated emission trajectories and associated consequences in terms of climate hazards (average temperature rise, sea level rise, the occurrence of extreme weather events, etc.). Depending on the time horizon considered, it may or may not be relevant to take into account the different climate paths and the interactions between policies and climate paths: where we consider a short time frame, the effects of policy decisions do not have time to make a significant impact. Climate scenarios may also be complemented with an assessment of their impacts in terms of GDP, employment, etc. These may be developed at various geographical granularity (from regional to worldwide). Work undertaken by the NGFS gives a good overview of these studies.

37. ESMA believes that it is not necessary to develop dedicated climate pathways or macroeconomic scenarios in the context of climate risk stress testing of CCPs. In particular, the market shocks applied in the climate risk stress tests of CCPs could be set in consistency with exogenous climate pathways and / or macro-economic scenarios. The focus of this call for evidence is the response of the CCP to an adverse development rather than the modelling of why this adverse development occurred.

38. This is not a fundamental hinderance to the construction of climate stress tests. On the contrary, the same approach is adopted for the stress testing of CCPs for traditional risks. When stress testing CCPs for credit risks, the default of one or several clearing members is taken as exogeneous to the exercise, and the exercise does not contain any modelling of why the member(s) goes into default. Furthermore, the market shocks applied in past ESMA-coordinated CCP stress tests were provided by the ESRB, as envisaged by EMIR. Those market shocks were developed by the ECB/ESRB on an overall macro-economic narrative.



39. The same logic can be applied to climate-related events: we take the climate event(s) as an input to the climate stress test and assess its impact on the CCP (and the market participants which are affected at the same time as the CCP). Similarly, if a new technology appears to fundamentally disrupt (for example) how energy is produced, the objective of ESMA's EU-wide CCP stress test is not to anticipate the speed of technological advancement in the future, the speed of costs reductions for new technologies, or the relative competitiveness of various technologies. However, this does not mean that understanding the exposure to a given sector or sub-sector of the economy is irrelevant in the context of CCPs.

40. A second element in defining the scope of this exercise relates to single materiality or double materiality. Single materiality focuses on the impact of climate risk on the CCP. Double materiality adds the impact of the CCP and its activities on the climate.

41. Single materiality has the advantage of consistency. The approach would be more in line with the climate stress tests carried out so far for other entities within the financial system, which focus on single materiality. Moreover, focussing on single materiality is in line with the methodology of previous ESMA CCP Stress Tests, which assess the risks to the CCP.

42. Moving towards double materiality would also raise the question of whether to include only direct impacts of the CCP (such as the electricity consumption of its IT equipment) or to also consider the indirect impacts linked to holding brown assets as part of the CCP's investment policy, or facilitating their trading through the central clearing of brown assets, which would be extremely difficult to quantify. For example, if a CCP is facilitating the trading of certain types of energy contracts, would it be considered responsible for greenhouse gas emissions associated with the production and/or use of that energy? This would be all the more difficult since CCPs are not lenders or financial intermediaries but financial networks supporting safe and efficient markets.

43. For these reasons, and without prejudice of where a study of the double materiality would fit at a later stage, ESMA will focus on single materiality in the context of CCP Stress tests.

### **3.2 Adapting stress test methodologies on climate risk to CCPs**

44. Adapting the stress test methodologies on climate risks, which are developed for other financial entities, to CCPs comes with several challenges. A main challenge is the absence of directly comparable work and CCP-focused literature on climate risk. For example, the NGFS scenarios provide the most comprehensive models and variables that can be directly used to stress financial actors (inflation, energy and commodity prices, interest rates, FX rates and equity indexes). However, understandably given the usual application of these scenarios to entities focussing on long-term asset holdings (mainly banks and insurers), the existing scenarios are long term (up to 30 years) and thus less suitable for CCPs.

45. In contrast, CCP stress testing tends to focus on what happens when a member is in default and when the CCP is responsible for the financial performance of the defaulter's portfolio. The

length period is typically commensurate with the margin period of risk usually applied by CCPs, which varies from 2 to 5 days (Article 26 of RTS 153/2013). Examples of this practice can be found in ESMA's prior EU-wide CCP stress tests (see also Annex I).

46. One way to handle this challenge would be to translate NGFS scenarios into different degrees of granularity (country and sector-specific) that can fit within available CCP stress-testing models. This is being explored by ESMA staff in other areas, although ensuring compatibility (and plausibility) of short-term movements with longer-term events in the context of CCPs, while keeping the scenario plausible, may remain challenging. This also brings in a separate, but related challenge, which is whether some events playing out on longer time horizons are relevant to CCPs.

47. The following subsection considers the key pillars of climate risk for CCPs and contains further considerations on the time horizon in the specific context of CCPs. This aims to build and extend on considerations developed in existing applications to other financial market sectors, such as banks, insurers, and investment funds. Moreover, it aims to provide answers to the challenges mentioned in this subsection.

### **3.3 Defining the four pillars of climate risk for CCPs**

48. Climate risks are usually categorised as either relating to transition risks or physical risks. For an overview of the classifications used in literature, please refer to [3] pp. 97-98, to [10] for definitions of physical and transition risks, and to [5] for a discussion of these risks.

49. However, when analysing the resources available, and with consideration given to the timeframe of the types of risks relevant to CCPs, ESMA is proposing to further detail this classification and establish four pillars of climate risks: physical risk, rapid<sup>11</sup> transition risk, business risk, and collateral replacement risk. The latter three may be seen as specific cases of the well-established concept of transition risk as defined in the work of the NGFS. This section of the document proposes definition for each of these pillars.

#### **3.3.1 Physical risk**

50. Climate change leads to higher physical risks, including higher frequency and intensity of the number of weather-related hazards. The impact of an extreme weather event may affect CCPs' physical premises, the premises of their clearing members, and/or those of their service providers of any nature, for example, liquidity providers, investment counterparties, payment system operations, and IT infrastructure providers.

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<sup>11</sup> In the literature surveyed, transition risk is not split by time horizon, and longer time frames are most commonly covered. Hence the adjective "rapid" used in this application.



51. Therefore, such an event could impair CCP functioning (including day-to-day operations). CCPs can also be adversely impacted through physical events on its clearing members and a deterioration of their creditworthiness (i.e. a higher probability of default losses).

52. This effect is similar to other operational risks which are already assessed. Some of the work carried out on operational resilience of CCPs and their business continuity planning (BCP) will bear a degree of resemblance with the assessment of this aspect of physical risk.

53. However, when assessing climate-related physical risk, the resulting operational risk is not the only effect. Indeed, recent extreme weather events, such as the cold weather front in the South of the USA at the start of 2021, have shown that energy prices could also be affected in such a scenario.

54. Therefore, physical risk should not only be defined as being a specific case of operational risk. It should also be defined as the effect of an extreme weather event on operations of the CCP or other entities to which it is exposed, combined with potential price movements on markets affected by the event. Furthermore, this impact is not limited to energy markets but may also affect financial entities and markets in other ways, for example, through commodities markets or by negatively impacting the stock price of affected companies.

55. It is possible to focus on acute physical events which materialise over a few days (e.g. floods), making them natural candidates for CCP stress testing work. There may be other, slower-moving (i.e. chronic), climate-related physical risk events that last several weeks or months, such as, for example, the erosion of grounds. For this initial exercise, we consider the shortest physical risk events possible, the relevance of which to CCPs is more obvious.

### **3.3.2 Rapid transition risk**

56. Transition risk relates to the financial and reputational risks faced by legal entities as part of the extensive policy, legal, technological and market changes that arise to address the efforts required to mitigate and adapt to climate change, see [10].

57. This could be the result of:

- climate policy;
- the introduction of a disruptive new technology making another technology obsolete or making a product or service suddenly more competitive or more environmentally friendly;
- a change in perceptions or preferences (which may be the result of anticipations linked to the first to points above).

58. Transition risk is typically assumed to include a sudden surprising event (i.e. appearing in a disorderly manner), which can in turn materially affect the wider economy over one year or longer (see, for example, the NGFS scenarios described in [10] and [11]).

59. On the one hand, a change in customer preference or investor behaviour could occur over a long period of time, making this unlikely to be relevant to a CCP. On the other hand, changes in investor perceptions or customer behaviour may occur far more rapidly. This may lead investors to shift their portfolio allocation and to divest from assets perceived to have higher exposure to climate transition risk, thereby increasing market volatility.

60. Such a sudden spike in market volatility, if combined with the default of one or several clearing members, would affect the CCP. It may also be that the market volatility is linked to the default of the member(s), though historically, when running credit stress tests, the link between the market moves and the default of one or several members has not been made explicitly.

61. In light of the considerations above, the question is whether it is plausible to consider, in the context of a CCP stress testing exercise, that investors could react to a (potential) change in regulation or technology in the time frame that the CCP requires to liquidate the positions of a defaulting member (2 to 7 days).

### **3.3.3 Business risk**

62. Transition risk and physical risk, as defined above, could materialise in a few days.

63. By contrast, a longer transition (over several years) away from specific types of products and services (as well as “brown” assets), to which investors and consumers would gradually prefer alternatives (e.g. “green” assets), may be relevant to the CCP, but this would not be the result of losses in a defaulting member’s portfolio.

64. Although a CCP typically does not hold the assets it clears (except during the liquidation of a defaulting member’s portfolio), it is exposed to the volumes it clears to the extent that its earnings are linked to cleared volumes. As such, a CCP is exposed to climate risk if its clearing activities are linked in part or in full to “brown” assets or activities, if and when volumes of transactions decline over time, and hence its earnings. Should this decline not be compensated by new activities and should fixed costs exist for the CCP, this could be a material risk to the CCP in the long run. Indeed, there is no guarantee that the CCP which cleared contracts on one commodity or type of energy will be able to substitute these with a comparable amount of contracts in the commodity or type of energy that displaced the old one.

65. While the discussion around “stranded assets” for investors is not new (see for example [7]), there is an interesting distinction for CCPs, relative to other financial sectors, insofar as their vulnerability is not to the direct loss in value of assets (since CCPs are not investors), but

rather to the residual effect of investor/member shifts in preferences away from some assets and towards others.

### **3.3.4 Collateral replacement risk**

66. The fourth and final pillar proposed in this paper explores second-round risks to CCPs, which is closer in spirit to the knock-on analysis of previous ESMA CCP Stress tests.

67. Requirements for eligible collateral posted by clearing members to the CCPs follow strict rules (see, for example, EMIR and RTS 153/2013). However, none of these rules include environmental aspects.

68. A CCP could require additional collateral if, for example, a long-term transition of financial markets away from assets issued by relatively more environmentally damaging issuers would cause a decline in the value of the assets used as collateral (independently from the CCP's actions). Assuming that CCP margining policies remain the same in the long-run, this wholesale and steady decline in value of a specific set of assets is likely to require additional collateral to be posted (either from 'green' sources or more of the same 'brown' sources), in order to compensate for this loss in value.

69. This slower-moving mechanism (relative to the previous three pillars discussed above) would create additional demand on the part of CCP members for some assets ("green") at the expense of others ("brown").

### **3.3.5 Other risks**

70. In addition to the above-mentioned risks, one can imagine that CCPs may be vulnerable to other types of climate-related transition risks, including legal and reputational risks.

71. Following a few recent lawsuits against member states on their climate policies, associations, individuals, or investors could bring forward litigation claims against a CCP (leading to a direct cost to the CCP) or against financial infrastructures or even non-financial companies to which the CCP is exposed.

72. ESMA considers that the public perception on climate risk is rapidly evolving, and that quantification of legal risks may be challenging to provide at this stage. Therefore, ESMA takes note of the presence of legal risks from a theoretical perspective without providing any indication of support or rejection of the validity of any possible claims that CCPs may face, but does not include legal risk in its assessment of climate risks for CCPs.

73. Reputational risk for a CCP perceived as supporting "brown" assets could also be mentioned as a possible source of additional risk. However, similar to the discussion on legal

risks, ESMA is of the view that CCP climate stress tests are not the appropriate context for starting to develop a framework for the quantification of reputational risk.

### 3.3.6 Summary

74. The following table summarises the four pillars.

Type of risk	Origin of the risk	Transmission channel	Relevant to 5 years?	Relevant to 5 days?
<b>Transition</b>	Change in climate policy, technology or preferences	Investors divesting, triggering market panic (e.g. drop of 16% on Nickel in March 2021 due to new extraction methodology announced)	-	+
<b>Physical</b>	Potentially very large list of acute weather events	Operational risk leading to disruptions as well as sharp changes in asset (energy) pricing (e.g. Texas cold front in February 2021)	-	+
<b>Business</b>	CCP overexposed to “brown” sectors (e.g. clearing oil futures)	Reduced earnings from lower clearing volumes leading to affecting the business model	+	-
<b>Collateral risk</b>	The CCP’s eligible collateral is affected by long term transition risk	Affects clearing members by forcing them to find over time replacement assets to post as margin	+	-

(Figure 1: four pillars of climate risks for CCPs - source: ESMA staff)

**Question 1.**

Do you agree with this classification of relevant climate risks for CCPs in these four pillars? Do you see one or several other climate risks that need to be added to this mapping (if so, please provide a definition, relevant time horizon, an approach to its measurement approach)?

## **4 How to model and parameterise each of these types of climate risks for an EU-wide CCP Stress Test**

75. This chapter contains questions on how to model each type of climate risk. The questions are drafted in the context of a cross-CCP stress test, but it is likely that some questions are also relevant for a single CCP stress test.

76. Respondents are invited to reply on what they believe would be a workable solution and need not limit themselves to already existing solutions in the context of climate stress tests.

### **4.1 Physical risk modelling**

77. Physical risk is triggered by a specific event. Therefore, the first necessary step to model physical risk is the identification of relevant events. The nature of these events can vary, for example, and may include floods, wildfires, landslides, heat waves, cold waves, or else. For a classification of potential events, one may refer to [23]. Beyond the nature of the event, its intensity can also vary (e.g. the height and duration of a flood). Last but not least, the location of the event is also a key variable (e.g. coastal vs. river floods, see [9]).

78. This wide variety could lead to a potentially very large number of scenarios. At the same time, it poses a challenge in terms of identifying which events are relevant as it is unlikely that every possible type of event has already occurred at the exact location of the CCP, or of the entities to which the CCP is exposed.

79. As a result, for the risk assessment to be performed as a stress test (as opposed to other types of analysis such as a sensitivity test), which is based on a scenario or a small number of scenarios, it is necessary to create a theoretical physical event with a timeline and narrative. If this is not possible, it may, also be possible to create a type of assessment of vulnerabilities that is not based on a specific scenario, but which would be closer in spirit to an inventory of

the risks<sup>12</sup> that could be relevant to the CCP, (for example listing the types of physical events and asking for each type whether and how it may affect the CCP).

80. In order to build a scenario, it may be useful to look at relevant events in the past or at different locations and extrapolate (in terms of timing, location, and severity) to the relevant circumstances. This logic is not dissimilar from the way past market events are used to build stress test scenarios for the credit component of a CCP stress test.

81. When it comes to physical risk events, various resources already exist and have been used in the context of climate stress tests in other sectors. For example, the publicly available European Commission's Joint Research Centre Risk Data Hub provides detailed information on river and coastal floods in Europe (see [9]). Similarly, the NGFS lists on its website physical datasets such as the Inter-Sectoral Impact Model Intercomparison Project for cross-sectoral modelling of the impacts of climate change.<sup>13</sup> However, other resources could be relevant in the specific context of CCPs.

**Question 2** on the selection of a physical event

- a. Is there a way to avoid having to specify the weather event (be agnostic on whether this is a flood or a landslide or a wildfire...)? Please describe.
- b. Which past events would you point out as relevant, and how relevant is empirical evidence in general in building a relevant scenario?
- c. To your knowledge, what are the available data resources to identify past or potential events (such as geographical maps of flood-paths or historical databases of past extreme weather events)?

82. The next step concerns modelling the effects of the physical risk event. For the assessment of the operational damage involved in physical risk, a given event must be translated into a disruption and requires the identification of entities that are affected (either the CCP or entities to which it is exposed such as clearing members or service providers, or both), in which way (e.g. a service being unavailable or delayed), and for how long.

83. Since we also consider in the definition of physical risk potential price movements in markets for commodities and other financial markets resulting from the physical event, the question of how to translate an event into adverse market moves arises. Examples of weather impacting energy markets exist (such as the cold wave in the South of the USA in 2021), but

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<sup>12</sup> A parallel with the more traditional assessment of market risk would be the difference between on the one hand the notional of exposures to certain types of financial instruments and on the other hand a stress test scenario with a simulated loss in this scenario.

<sup>13</sup> See <https://www.ngfs.net/ngfs-scenarios-portal/data-resources>

there is at least an effort to adapt them from one region to another, from one period to another, and potentially from one market to another.

**Question 3** on quantifying the impact

- a. How should the assessment of the impact of physical risk on entities to which the CCP is exposed be conducted? (e.g. a questionnaire sent by the CCP to these entities? Any other approach?)
- b. How would you calibrate market moves corresponding to a given scenario of physical risk? In particular, would you use past events that had an impact on financial markets?
- c. Would this only affect energy/commodity prices, or would other asset classes be impacted? Please elaborate.

84. When aggregating results across CCPs, a unique challenge presents itself with respect to the assessment of operational disruptions, which is the confidentiality of information concerning sensitive infrastructures such as data centres and their back-up sites.

85. Indeed, the outcome of this exercise cannot be published in a way that would reveal the location of all these sites as part of the assessment of which ones would simultaneously be affected by the same event. Yet, the exercise should not limit itself to assuming the headquarters concentrate all the activity of the CCP, and it is necessary to take into account BCP efforts in place (back-up facilities being one of them) as well as teleworking arrangements, which have increasingly become part of the work life of most service industry companies.

86. A proposal to circumvent this issue would be to use the following process, at least for the operational impact of physical events:

- i. Use a common map and a scenario or set of scenarios, possibly with a scoring approach (such as: assume a flood between [1] and [2] meters in zone XX of the map; assume wildfires totally destroy zone YY).
- ii. Ask each CCP the outcome of the scenario (responses would be grouped in categories such as operational outage of less than 2 hours / operational outage 2hr-1day/...).
- iii. Depending on feasibility, the CCPs could ask their counterparties to carry out the same assessment so that it would feed into their result (in addition to the assessment of the direct impact on the CCP).

87. When publishing results, the report would not identify CCPs nor geographical zones, but only contain a limited disclosure such as “the largest impact of a flood in any zone of the map is on a CCP experiencing a delay to access funds for xx amount of time, and on another CCP being unable to clear trades for a period between 2 hours and one day”.

#### **Question 4 on the management of data**

- a. Do you agree that the process presented above would address the confidentiality issue related to the location of CCP facilities?
- b. In particular, what challenges would you expect for step iii.?
- c. Would you include in step iii a question from the CCP to the participants of how the market moves of the scenario would affect them, or would the question focus on the operational disruption? (please justify)
- d. Is there an alternative process that would avoid disclosing sensitive proprietary information? Please describe.
- e. How would the market moves associated with the physical event be reported in this framework (while ensuring anonymity and confidentiality needs)?

## **4.2 Rapid transition risk modelling**

88. The modelling of transition risk also poses a number of challenges. The first one concerns the scope of the modelling of transition risk. Since transition risk is the materialisation of the effect of regulatory or technological changes or the perception of consumers and investors, a key design choice is to decide how far to take the modelling exercise and which possible changes to consider.

89. ESMA staff argues that, when it comes to the specific case of climate risk scenario analysis for CCPs, modelling the potential source of transition risk should remain out of the scope, because this modelling would imply at least one of the following:

- Create scenarios anticipating on future policy actions<sup>14</sup> and on the way their introduction would be managed (a sudden announcement with a short time to comply would be more likely to result in market movements in a timeframe such as the one considered here).
- Create scenarios anticipating future technological breakthroughs including unanticipated disruptive technologies, their impact on climate change objectives, or the way they could make other technologies obsolete.

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<sup>14</sup> In practice, it would be possible to refer to scenarios anticipated by the NGFS for policy actions. However, the very short time frame of the fast transition risk for CCP stress tests means the manner in which the policy actions would be announced could have a determining impact on our specific scope (market moves in a few days).



- Explicitly model investor psychology and customer behaviour in the face of the uncertainty linked to the two points above and how this translated into market price movements.

90. In the same way that the default of one or several clearing members is assumed to occur without prejudice of the reasons why it occurred, the climate stress test could be built around a solution that would avoid the pitfalls identified above.

91. This would create a market risk scenario akin to the market shocks used in the credit component of the existing stress test, although the origin of the market shock would have a very specific narrative.

92. The impact of the market event would materialise in the clearing members' portfolios, and become a risk for the CCP at the moment one or several clearing members were to default.

93. Regarding the nature of the market moves, these may not necessarily be a first order move (e.g. all energy contracts of a certain type affected by the same market shock) but it could also be a move affecting the price difference between one type of contract and another. For example, the price difference between contracts linked to different types of energy.

#### **Question 5 on transition risk**

- a. What is your view on the plausibility of sharp market moves materialising in a time frame commensurate with the liquidation horizon of a CCP, as the sole result of transition risk? (if needed, please distinguish between types of market moves, e.g. first order price move affecting a large set of contracts vs. specific changes in a basis risk between two related contracts).
- b. Should the stress test use scenarios with a narrative on a possible change of policy and/or technology in order to identify the root cause for the transition risk?
- c. If so, how would these be crafted? Please provide one or a few examples.
- d. If not, should the analysis consist of a list of potential areas of vulnerability? How would this be done? (e.g. should there be a list of assets exposed to a given technology, should this be based on a survey of all technologies currently under development and the assessment of what they could replace if they suddenly became viable?). Please elaborate.
- e. If no explicit root cause is modelled, how would you select and calibrate the market moves resulting from transition risk?

### 4.3 Business risk modelling

94. Business risk is of a different nature from the previous two risks identified insofar as it materialises over an extended period of time.

95. It may also be a risk that is more generically monitored by CCPs, outside of the specific theme of climate risk, in the same way that any company looks at revenue projections.

96. Where a CCP gets a significant portion of its earnings in activities that may be affected by climate change and climate change policies, this becomes a risk to the CCP's business model, especially if its fixed costs are high.

97. In a sense, business risk is the long-dated version of transition risk as described above, but there is a difference: while for a short-term transition risk to affect the CCP, it is necessary to assume one or several clearing members to default at the same time, the business risk directly affects the CCP's capital even in the absence of a default.

98. Some activities are more directly impacted by this risk (e.g. clearing emission permits, energy contracts), but caution needs to be exercised before limiting the scope of the exercise. For example, the price of financial assets (e.g. equity instruments, bonds) may be affected by broader ESG-related information or assessments (such as ESG ratings) that are liable to impact their business risk, and companies whose securities are cleared at a CCP may themselves be subject to changes in consumer and investor preferences. While the CCP is not directly affected by the value of the assets, it would be affected if the changes in consumer and investor preferences were the cause of a decrease in the clearing volumes of these securities or of derivatives referencing the securities.

99. This taken into account, the following questions are raised on how to model business risk.

#### **Question 6 on business risk**

- a. Which sectors should be considered: only energy, all commodities, or all asset classes (for example by considering that some securities are issued with an ESG rating different from others)?
- b. Should the business risk be assessed across CCPs by using a common scenario for the reduction in activity for a given type of asset (e.g. a decrease in the use of oil futures contracts)?
- c. If so, how would the scenario be calibrated (e.g. if a given path is assumed for the consumption of a commodity, how would this be turned into a decrease in the activity for the future contracts referencing this commodity)?
- d. What should the time horizon of this analysis be?
- e. What confidentiality constraints would you see for the publication of results?

## 4.4 Collateral replacement risk modelling

100. ESMA's previous CCP Stress Test Exercises have analysed the breakdown of collateral held by CCPs per asset class (see for example section 4.1.3 in [14]). The analysis of potential future climate-related developments and their impact on CCP collateral is therefore an extension of an existing analysis. While the existing breakdown was helpful in getting a view of the liquid resources available to CCPs in case of a default, the present aim is different: it captures the impact on the market and participants of potential changes in collateral eligibility. This is closer to the spirit of study of procyclicality and knock-on effects of possible changes that could affect collateral.

101. ESMA staff consider that two climate-related events, in particular, could force clearing members to need new collateral to post to the CCP:

- the assets they use would no longer be eligible, for example if new climate-related collateral eligibility constraints applied
- the assets could gradually lose value as investors would require increasing risk premia to hold them as opposed to “greener” assets or become more volatile

102. While the impact of the former is obvious, the second may also be material. As the members would be expected to post a given amount labelled in a given currency, when a security loses value, it becomes necessary to post additional collateral. If the asset is more volatile, it is likely that the haircuts could increase, which would also have the effect that the clearing members would need to post additional collateral. If the increase of volatility becomes too large, a security may also no longer be seen as having sufficiently “low market volatility” and would no longer meet the requirements of RTS 153/2013 to be eligible.

103. The first step will therefore be to identify what changes could occur. One would expect this to be on a long-time horizon, as one would not anticipate regulators to take sudden and unanticipated action creating market panics.

### **Question 7 on collateral replacement**

- a. In your view, are there any other climate-related events that could force clearing members to post new collateral to a CCP?
- b. Should this type of climate risk only be applied to collateral or would the CCP's investments be subject to the same type of risk?
- c. Should the loss of value and/or the increased market volatility of the securities be taken into account? If not, please justify.
- d. What would be relevant climate-related information to use in order to identify which assets may need to be replaced?

e. What types of assets would be concerned and how would you identify an asset as being potentially affected by climate-related changes in investor preferences in the future?

f. Should the outcome be just a disclosure of the concerned assets by CCP; or is there a quantitative impact (e.g. “XX bn of bonds and YY bn of equities would need to be replaced in the next ZZ years”)?

g. What should be the time horizon of this analysis?

## 5 Existing and planned CCP practices

104. While to our knowledge, no regulatory cross-CCP climate stress test has been done, some CCPs might have put in place measures or exploratory approaches related to climate change and climate risk, or have plans to do so in the near future. An inventory of these practices could bring further support and ideas in the building of a coordinated exercise.

105. The following questions relate to the existing practices as well as planned developments.

106. The responses to this section are expected to differ from those of the previous, not only as it focuses on the existing (or soon to exist) tools, but also because the CCP’s individual practices will probably differ, at least in part, from what is to be put in place in a cross-CCP exercise.

107. Whenever a question is written in the present or in the past tense, please add any plans for a future implementation.

108. The following questions are addressed only to respondents from CCPs.

### Question 8 on general practices

a. Did your CCP carry out any assessment of climate risk?

b. Did this assessment concern all clearing services or only some of them?

c. Did the assessment concern only clearing exposures or did it include other areas (please provide a short description)?

d. Was this assessment a one-off or is it (will it be) a recurring topic?

e. To which internal governance bodies was this assessment communicated (Risk Committee, Board...)?

f. Did it lead to an action plan (please describe shortly)?

g. Was the assessment communicated to the NCA?

#### **Question 9 on the mapping of risks**

- a. Does the assessment of climate risk feed into an existing mapping of risks, such as credit/liquidity/operational/business... or did you create one or several new risk categories (possibly along the lines of the four pillars described in this paper)?
- b. If new categories of risk are identified, please list them with a short description
- c. Does the assessment cover the activities of the CCP's members?
- d. Does the assessment cover the activities of the CCP's other counterparties and some of all service providers? (please state which categories)
- e. What is the starting point of the scenarios built? (CO2 path, GDP path, specific theoretical or historical events?)
- f. Please list the historical events that are used and considered as relevant to the CCP's climate risk assessment.

#### **Question 10 on Physical risk**

- a. Is physical risk part of the assessment?
- b. What types of physical events are taken into account? How were they selected?
- c. Do the scenarios considered include market movements? operational disruptions? Any other aspect? Please provide a short description
- d. If the scenarios include market moves, are they integrated in the regular stress testing (or other regular risk assessment) or a separate assessment?
- e. If market moves are included in the scenario, please describe shortly the calibration method, and whether consistency with specific climate change scenarios were considered.
- f. Is the format of the assessment a set of scenarios and their outcome (operational, financial or other)? please describe if this is another format.

**Question 11 on Transition risk**

- a. Is transition risk part of the assessment?
- b. Is it based on a set of scenarios? If so, please indicate the number of scenarios, and whether they are integrated to the regular stress test scenarios or separate
- c. What is the basis for the scenarios (NGFS or other, please elaborate)?
- d. What is the time horizon of the scenario?
- e. Is the output a mapping of risks, a sensitivity test, or a classical stress test with a loss computed for the various margin accounts?

**Question 12 on Business risk**

- a. Is Business risk part of the assessment?
- b. Is the output a projection of revenues/profitability, a mapping of “brown” vs “green” assets, or another form or output (please specify)?
- c. What is the time horizon contemplated?

**Question 13 on Collateral replacement**

- a. Do you assess the collateral and/or investment assets in terms of their environmental impact? If so, how do you assess a given asset/issuer/sector?
- b. What are the conclusions of this assessment?
- c. To whom are the results communicated outside the CCP?
- d. What is the time horizon of any projection in this respect?

**Question 14 on other risks** Are there other risks in your assessment or planned assessment? Please describe.

**Question 15 on remedial actions**

- a. Does the CCP have in place (or is working on the establishment of) remedial actions as a result of the assessment of climate risk?
- b. In particular, has there been, or will there be a change to the BCP?
- c. For each type of risk identified, does the assessment of climate risk take into account remedial actions (for example: if a business line is at risk due to transition of the market out of certain assets, does the assessment make the assumption that a new business line will replace it as a source of revenue; are back-up facilities taken into account when assessing the impact of a flood at the location of the headquarters...)?
- d. Does the CCP have environmental disclosures in place, does it have a plan to introduce or change environmental disclosures?

## 6 Annexes

### 6.1 Annex I – Previous ESMA CCP Stress test exercises

109. Previous ESMA CCP Stress Tests have gradually built an increasingly comprehensive approach to the CCPs' risks.

110. In all these exercises, the basic mechanic is the following: a specific narrative was provided to the CCPs with a date (it is useful to specify a date, as the CCPs will use the inventory of positions at that given date), and a set of shocks to be applied to prices. In return, the CCPs compute the losses for any member defaulting, and on that basis ESMA selects the defaulters which cause the largest combined loss across the board.

111. While each CCP uses a set of stress test scenario to assess the adequacy of its financial resources, ESMA's stress tests encompass all EU CCPs at the same time (and some relevant<sup>15</sup> non-EU CCPs). Therefore, the goal is somewhat different. Rather than checking the compliance with EMIR of the sizing of the resources of each CCP, the aim is to identify vulnerabilities across the CCP landscape on the basis of a reduced number of common scenarios, as well as identifying some interdependencies across the market.

112. The first exercise focused on Credit exposures, i.e. the risk linked to losses in the portfolios of one or several members defaulting at the same time as financial markets experience volatility. The report contained an anonymised set of results.

113. The second exercise added Liquidity stress testing, i.e. the risk that the availability of financial resources for the CCPs may be delayed for any reason. The results for credit exposures were no longer anonymised, but the results for the liquidity stress test were anonymised.

114. The third exercise added Concentration risk, i.e. the risk that large positions in a defaulting member's portfolio would be large and that their liquidation would incur larger transaction costs, and the liquidity stress test results were no longer anonymised.

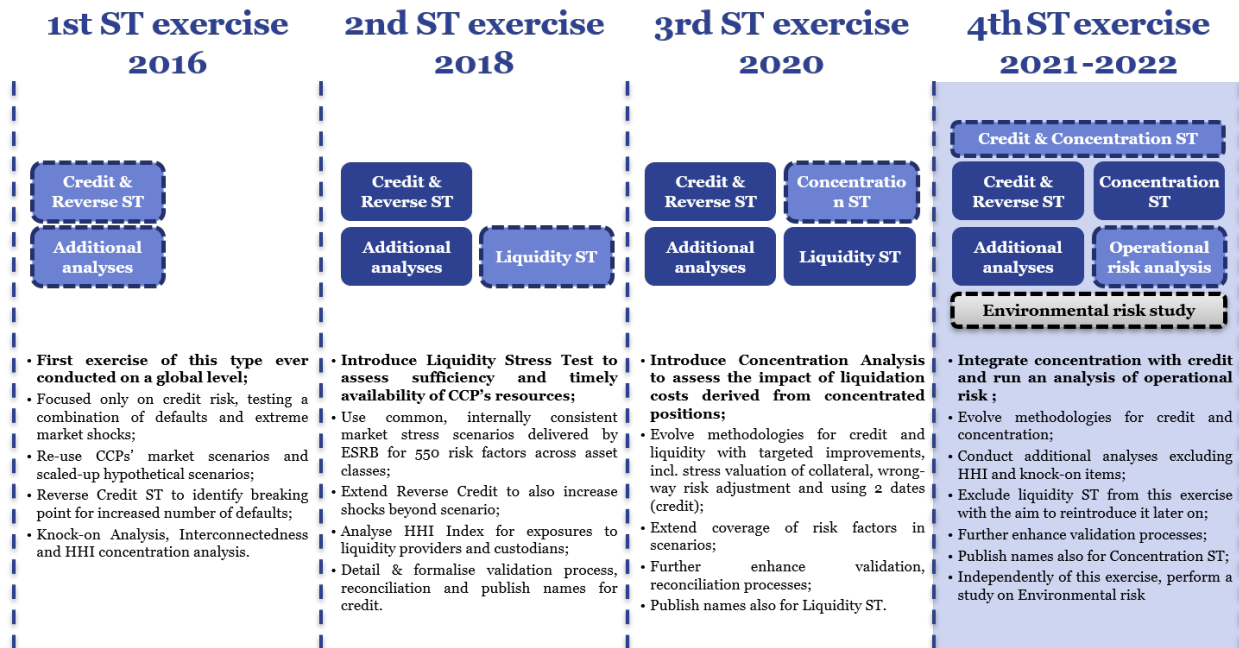
115. The fourth exercise introduced operational risk. The results of the fourth exercise are to be published yet.

116. The following table summarises the evolution of the Stress Test

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<sup>15</sup> Currently this applies to two UK CCPs in addition to 12 EU CCPs





(figure 2: previous ESMA CCP stress tests – source ESMA staff)

## 6.2 Annex II - Sustainable finance and ESMA

117. The EU is one of the parties that adopted the Paris Agreement on climate change and the UN 2030 Agenda for Sustainable Development in 2015. Under these international commitments and the European Green Deal, sustainable finance has a key role to play in the EU's transition to a low-carbon, more resource-efficient and sustainable economy.

118. The EC has been developing a comprehensive policy agenda on sustainable finance. In 2018, it published its Action plan on financing sustainable growth<sup>16</sup> with the aim to reorient private capital to more sustainable investments, mainstream sustainability into risk management and foster transparency and long-termism. Building on initial progress, the EC published last July a broad ranging strategy on sustainable finance (also called its Renewed Strategy).<sup>17</sup>

119. Financial markets have also been impacted by the development of sustainable finance. Investor preferences are shifting towards an interest in financial products that incorporate ESG factors and markets for sustainable financial products have continued to grow. Moreover, sustainability factors are increasingly affecting the risks, returns and value of investments. This

<sup>16</sup> European Commission [Action plan on financing sustainable growth](#), March 2018

<sup>17</sup> [European Commission Strategy for financing the transition to a sustainable economy, 6 July 2021](#). ESMA notably replied on 15 July 2020 to the EC consultation on RSFS2

changing environment has implications for ESMA's mission to enhance investor protection and promote stable and orderly financial markets.

120. In order to respond to these new challenges, and in line with the EC policy agenda and the revised ESMA Regulation [18], which grants it additional responsibilities and tasks in relation to sustainable finance, ESMA established a Strategy for Sustainable Finance<sup>18</sup> in February 2020.

121. As a first step to implement ESMA's mandate in this area, across its four activities, the Strategy set out key objectives which can be summarised as follows:

- a. Integrating sustainability in the development of the Single Rulebook<sup>19</sup>;
- b. Building common approaches for incorporating Environmental, Social and Governance (ESG) factors in the supervisory practices of National Competent Authority's (NCA);
- c. Monitoring market developments and integrating sustainability-related risks as part of ESMA's regular risk assessment and stress-testing exercises;
- d. Improving transparency on the role of ESG factors in the credit rating process.

122. In line with this Strategy, sustainable finance has become part of ESMA's various Annual Work Programmes (AWP) since 2020, both as a cross-cutting theme and through specific implementation objectives under sectoral chapters.

123. In its July 2021 Renewed Strategy for Sustainable Finance, the EC identified a number of actions aimed at "enhancing economic and financial resilience to sustainability risks".<sup>20</sup> In particular, the EC seeks to improve the "identification, measurement and management of risks at the system level"<sup>21</sup> through closer cooperation at European level and additional work "to develop coherent and relevant methodologies and scenarios to quantify sustainability risks and to stress test the resilience of the financial system, covering relevant financial sectors"<sup>22</sup>.

124. On the regulatory side, new disclosure requirements for companies and financial market participants have been developed to cover sustainability-related financial risks exposure (under the Sustainable Finance Disclosure Regulation (SFDR), the Taxonomy Regulation and the forthcoming Corporate Sustainability Reporting Directive (CSRD)). This data is meant to help financial and non-financial companies better identify, monitor, assess and manage their business and financial risks, where sustainability factors are material.

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<sup>18</sup> ESMA22-105-1052 [Strategy on Sustainable Finance](#), 6 February 2020

<sup>19</sup> [Interactive Single RuleBook available](https://www.esma.europa.eu/rules-databases-library/interactive-single-rulebook-isrb) at <https://www.esma.europa.eu/rules-databases-library/interactive-single-rulebook-isrb>

<sup>20</sup> [European Commission Strategy for financing the transition to a sustainable economy, 6 July 2021](#).

<sup>21</sup> Idem

<sup>22</sup> Idem

### 6.3 Annex III – References

- [1] NGFS, 2021, Scenarios in action, progress report  
<https://www.ngfs.net/sites/default/files/medias/documents/scenarios-in-action-a-progress-report-on-global-supervisory-and-central-bank-climate-scenario-exercises.pdf>
- [2] EBA, 2020, Report on management and supervision of ESG risks for credit institutions and investment firms  
[https://www.eba.europa.eu/sites/default/documents/files/document\\_library/Publications/Reports/2021/1015656/EBA%20Report%20on%20ESG%20risks%20management%20and%20supervision.pdf](https://www.eba.europa.eu/sites/default/documents/files/document_library/Publications/Reports/2021/1015656/EBA%20Report%20on%20ESG%20risks%20management%20and%20supervision.pdf)
- [3] FSOC, 2021, Report on Climate-Related Financial Risk  
<https://home.treasury.gov/system/files/261/FSOC-Climate-Report.pdf>
- [4] NGFS, 2021, Climate scenarios for central banks and supervisors - Phase 2  
[https://www.ngfs.net/sites/default/files/media/2021/08/27/ngfs\\_climate\\_scenarios\\_phase2\\_june2021.pdf](https://www.ngfs.net/sites/default/files/media/2021/08/27/ngfs_climate_scenarios_phase2_june2021.pdf)
- [5] ECB and ESRB, 2020, Positively green: measuring climate change risks to financial stability  
[https://www.esrb.europa.eu/pub/pdf/reports/esrb.report200608\\_on\\_Positively\\_green\\_-\\_Measuring\\_climate\\_change\\_risks\\_to\\_financial\\_stability~d903a83690.en.pdf?c5d033aa3c648ca0623f5a2306931e26](https://www.esrb.europa.eu/pub/pdf/reports/esrb.report200608_on_Positively_green_-_Measuring_climate_change_risks_to_financial_stability~d903a83690.en.pdf?c5d033aa3c648ca0623f5a2306931e26)
- [6] EACH, 2021, Climate Risk and CCP Risk Management  
<https://www.eachccp.eu/wp-content/uploads/2021/02/EACH-Paper-Climate-Risk-and-CCP-Risk-Management-Feb-2021.pdf>
- [7] NGFS, 2019, A call for action - Climate change as a source of financial risk  
[https://www.ngfs.net/sites/default/files/medias/documents/ngfs\\_first\\_comprehensive\\_report\\_-\\_17042019\\_0.pdf](https://www.ngfs.net/sites/default/files/medias/documents/ngfs_first_comprehensive_report_-_17042019_0.pdf)
- [8] De Nederlandsche Bank, 2018, An energy transition risk stress test for the financial system of the Netherlands, Occasional studies, Volume 16-7.  
<https://www.dnb.nl/en/publications/research-publications/occasional-studies/nr-7-2018-an-energy-transition-risk-stress-test-for-the-financial-system-of-the-netherlands/>
- [9] ECB and ESRB, 2021, Climate-related risk and financial stability - Data supplement  
[https://www.ecb.europa.eu/pub/pdf/other/ecb.climateriskfinancialstability202107\\_annex~4bfc2dbc5e.en.pdf](https://www.ecb.europa.eu/pub/pdf/other/ecb.climateriskfinancialstability202107_annex~4bfc2dbc5e.en.pdf)
- [10] TCFD (Task Force on Climate-Related Financial Disclosures), 2017, Final report: Recommendations of the Task Force on Climate-Related Financial Disclosures  
<https://www.fsb-tcfd.org/publications/>

[11] ESMA, 2021, Report on Trends, Risks and Vulnerabilities: Fund Portfolio Networks: A Climate Risk Perspective

[https://www.esma.europa.eu/sites/default/files/library/esma50-165-1524\\_trv\\_1\\_2021.pdf](https://www.esma.europa.eu/sites/default/files/library/esma50-165-1524_trv_1_2021.pdf)

[12] EC, 2021, Classification of weather events in the EU Taxonomy

<https://ec.europa.eu/sustainable-finance-taxonomy/documents/CCA%20Appendix%20A.pdf>

[13] ESMA, 2016, First ESMA CCP Stress test report.

[https://www.esma.europa.eu/sites/default/files/library/2016-658\\_ccp\\_stress\\_test\\_report\\_2015.pdf](https://www.esma.europa.eu/sites/default/files/library/2016-658_ccp_stress_test_report_2015.pdf)

[14] ESMA, 2017, Second ESMA CCP Stress test report

[https://www.esma.europa.eu/sites/default/files/library/esma70-151-1154\\_eu-wide\\_ccp\\_stress\\_test\\_2017\\_report.pdf](https://www.esma.europa.eu/sites/default/files/library/esma70-151-1154_eu-wide_ccp_stress_test_2017_report.pdf)

[15] ESMA, 2020, Third ESMA CCP Stress test report

[https://www.esma.europa.eu/sites/default/files/library/esma70-151-3186\\_3rd\\_eu-wide\\_ccp\\_stress\\_test\\_report.pdf](https://www.esma.europa.eu/sites/default/files/library/esma70-151-3186_3rd_eu-wide_ccp_stress_test_report.pdf)

[16] ESMA, 2021, Announcement of the fourth ESMA CCP Stress test.

<https://www.esma.europa.eu/press-news/esma-news/esma-launches-2021-central-counterparties-stress-test>

[17] NGFS, 2020, Guide for Supervisors: Integrating climate-related and environmental risks into prudential supervision, Technical Document, May 2020

[https://www.ngfs.net/sites/default/files/medias/documents/ngfs\\_guide\\_for\\_supervisors.pdf](https://www.ngfs.net/sites/default/files/medias/documents/ngfs_guide_for_supervisors.pdf)

[18] ESMA founding regulation:

[https://www.esma.europa.eu/sites/default/files/library/2015/11/1095-2010\\_esma\\_regulation\\_amended.pdf](https://www.esma.europa.eu/sites/default/files/library/2015/11/1095-2010_esma_regulation_amended.pdf)

[19] ESMA, 2021, Fund portfolio networks: a climate risk perspective, ESMA Report on Trends, Risks and Vulnerabilities, No. 1, 2021:

[https://www.esma.europa.eu/sites/default/files/library/esma50-165-1524\\_trv\\_1\\_2021.pdf](https://www.esma.europa.eu/sites/default/files/library/esma50-165-1524_trv_1_2021.pdf)

[20] EBA, 2021, Mapping climate risk, main findings from the EU-wide pilot exercise.

[https://www.eba.europa.eu/sites/default/documents/files/document\\_library/Publications/Reports/2021/1001589/Mapping%20Climate%20Risk%20-%20Main%20findings%20from%20the%20EU-wide%20pilot%20exercise%20on%20climate%20risk.pdf](https://www.eba.europa.eu/sites/default/documents/files/document_library/Publications/Reports/2021/1001589/Mapping%20Climate%20Risk%20-%20Main%20findings%20from%20the%20EU-wide%20pilot%20exercise%20on%20climate%20risk.pdf)

[21] EIOPA, 2020, Sensitivity analysis of climate change related transition risks.

[https://www.eiopa.europa.eu/media/news/sensitivity-analysis-of-climate-change-related-transition-risks-eiopa%E2%80%99s-first-assessment\\_en](https://www.eiopa.europa.eu/media/news/sensitivity-analysis-of-climate-change-related-transition-risks-eiopa%E2%80%99s-first-assessment_en)

[22] ECB and ESRB, 2021, Climate-related risk and financial stability

<https://www.ecb.europa.eu/pub/pdf/other/ecb.climateriskfinancialstability202107~87822fae81.en.pdf>

[23] ECB, 2021, Economy-wide climate stress tests

<https://www.ecb.europa.eu/pub/pdf/scpops/ecb.op281~05a7735b1c.en.pdf>

[24] CFTC, 2020, Managing climate risk in the US

[https://www.cftc.gov/sites/default/files/2020-09/9-9-](https://www.cftc.gov/sites/default/files/2020-09/9-9-20%20Report%20of%20the%20Subcommittee%20on%20Climate-Related%20Market%20Risk%20-%20Managing%20Climate%20Risk%20in%20the%20U.S.%20Financial%20System%20for%20posting.pdf)

[20%20Report%20of%20the%20Subcommittee%20on%20Climate-Related%20Market%20Risk%20-](https://www.cftc.gov/sites/default/files/2020-09/9-9-20%20Report%20of%20the%20Subcommittee%20on%20Climate-Related%20Market%20Risk%20-%20Managing%20Climate%20Risk%20in%20the%20U.S.%20Financial%20System%20for%20posting.pdf)

[%20Managing%20Climate%20Risk%20in%20the%20U.S.%20Financial%20System%20for%20posting.pdf](https://www.cftc.gov/sites/default/files/2020-09/9-9-20%20Report%20of%20the%20Subcommittee%20on%20Climate-Related%20Market%20Risk%20-%20Managing%20Climate%20Risk%20in%20the%20U.S.%20Financial%20System%20for%20posting.pdf)