PRUDENTIAL TREATMENT OF SUSTAINABILITY RISKS

Discussion Paper

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European Insurance and Occupational Pensions Authority

CONTENTS

Responding to this Paper

EIOPA welcomes comments on the discussion paper on the “Prudential Treatment of Sustainability Risks”.

Comments are most helpful if they:

- respond to the question stated, where applicable;
- contain a clear rationale; and
- describe any alternatives EIOPA should consider.

Please send your comments to EIOPA using the EU Survey Tool by Sunday, 5 March 2023, 23:59 CET. Contributions not provided using the EU Survey Tool or submitted after the deadline will not be processed.

Publication of Responses

Contributions received will be published on EIOPA’s public website unless you request otherwise in the respective fields of the survey.

Please note that EIOPA is subject to Regulation (EC) No 1049/2001 regarding public access to documents and EIOPA’s rules on public access to documents.[1]

Contributions will be made available at the end of the public consultation period.

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[1] Public Access to Documents.

1. EXECUTIVE SUMMARY

1. EIOPA's work on sustainable finance reflects the important role of insurers as long-term investors and risk managers, ensuring that the prudential framework reflects sustainability risks in the areas of solvency, consumer protection and financial stability in an adequate manner.
2. As a risk-based and forward-looking framework, Solvency II can manage sustainability risks within its conceptual structure, as the tools implemented to measure and mitigate investment and underwriting risks can for the most part also be applied to sustainability risks.
3. As long-term institutions, sustainability risks, and in particular climate-related risks, are important and will become more so for the investment and underwriting activities of insurers. Climate change as a source of transition risks related to the decarbonization of the real economy might raise investment losses due to stranded assets, particularly relevant for economic activities unable to adapt their business models accordingly. As a source of physical risks, climate change already affects insured losses stemming from natural catastrophes and extreme weather events, making the adaptation to climate change a key task for future insurance markets.[2]
4. From a prudential perspective, it is important that insurance regulation addresses the influence of sustainability risks underlying the investment and underwriting activities appropriately from a risk-based perspective. The discussion paper outlines the intended scope, methodologies and data sources for EIOPA's analysis in this regard, which is motivated by the proposed mandate in Article 304a of the Solvency II Directive, requiring EIOPA to assess the potential for a dedicated prudential treatment of assets and activities associated substantially with environmental or social objectives.[3]
5. The risk-based analysis of the potential influence of sustainability risks on prudential risks is generally a complex and challenging task, particularly due to the inconsistency of definitions around ESG-related objectives and factors, the uncertainty about economic transmission channels of ESG-related factors to materialize as prudential risks as well as the lack of high-quality and granular ESG-related data.[4]
6. While the scope of environmental or social objectives currently discussed in light of sustainable finance is very broad, a corresponding prudential analysis needs to be risk-based and potential policy implications evidence-based. Against the background of ESG-related data gaps

[2] EIOPA (2022a).

[3] Proposal for an Amendment to Directive 2009/138/EC.

[4] NGFS (2022a).

constraining the scope for a prudential analysis, EIOPA focuses its assessment in the context of the proposed Solvency II mandate on the following three areas that seem most appropriate for the analysis.

7. Firstly, as a risk-based environmental objective for insurance undertakings' investment activities, EIOPA proposes to study the link between climate change-related transition risks and prudential risks, since data availability seems to be most advanced in this regard. Secondly, in terms of the underwriting activities of insurance undertakings, EIOPA proposes to focus on climate change adaptation in terms of climate-related risk prevention. As climate change is substantially raising physical risk exposures, climate change adaptation can be considered as a risk-based environmental objective of outstanding importance to increase the resilience of the society and economy against climate change. Finally, given the stage of the public debate on the appropriate definition of social objectives and social risks, EIOPA aims as regards social aspects to provide an initial analysis of the corresponding Pillar II and III requirements under Solvency II and to identify potential areas for further analysis, as well as to initiate discussions on the appropriate prudential consideration.

Assets and Transition Risk Exposures - Motivation

8. The first area of the intended analysis covers investments in light of climate change, focusing on transition risks stemming from the transition process towards a low-carbon economy as a risk-based environmental objective.
9. In order to effectively tackling climate change and keep the rise in mean global temperature well below 2 °C above pre-industrial levels, and preferably to limit the increase to 1.5 °C, massive investments and emission cuts are needed. Expectations on necessary annual global investments reach around 2.4 trillion USD, and global greenhouse gas emissions need to be reduced by half until 2030.[5] More specifically at the sectoral level of economic activities, current research estimates the need for material cuts in greenhouse gas emission levels across most economic sectors over the next decades, but with particularly massive emission cuts needed for sectors heavily related to the production or use of fossil fuels in terms of oil, coal and gas.[6]
10. In this regard, firms need to adapt quickly to a low carbon economy, and those firms associated with substantial greenhouse gas emission levels which cause environmentally-related externalities may see those materialize negatively in asset prices through transition risk.
11. Climate-relevant changes in policy and regulation affecting business models and funding are typically considered as drivers of transition risk, together with the emergence of disruptive technological developments less harmful to the environment and shifts in market sentiment in

[5] UNEP (2021); IPCC (2018).

[6] Teske et al. (2022).

terms of changing investor or consumer preferences towards environmentally less harmful business models.[7]

12. The internalization of firms' environmentally-related externalities might be associated with changes in the market risks of the financial instruments issued by these firms, which could potentially create environmentally-related risk differentials. For instance, if transition risks materialize in a lower profitability or more volatile cash-flows for firms engaging in environmentally harmful economic activities, these firms should show higher levels of market risks relative to firms with less harmful activities.
13. Substantial progress has been made over the last years on the definition and measurement of environmental characteristics and the availability of corresponding data. Building on that, recent evidence in the literature highlights the potential for a materialization of transition risks in asset prices.[8]
14. Given the increasing evidence in the literature, EIOPA considers it relevant to start assessing quantitatively the potential for a dedicated treatment of transition risk exposures in the solvency capital requirements. EIOPA proposes to focus the analysis on market risks in terms of equity, spread and property risk, as these market risk categories relate to the most relevant asset classes for undertakings.
15. Firms with higher levels of transition risk exposures are typically associated with higher levels of greenhouse gas emissions, and these firms need to adapt quickly and fundamentally to be aligned with a low-carbon economy.[9] However, the opposite relationship does not necessarily hold, as assets with relatively low greenhouse gas emission levels can also be exposed to transition risk, particularly regarding the emergence of more climate-friendly technological developments. From a prudential and risk-based perspective, it is important to ensure that potential differences in the transition risk exposure of assets are appropriately reflected in the corresponding regulatory treatment. Therefore, EIOPA considers it important to assess the potential for a dedicated prudential treatment for the entire range transition risk exposures, i.e. for assets with a higher exposure to transition risk as well as those with a lower exposure.
16. Moreover, EIOPA considers it important to combine a backward-looking analysis based on historic time series data with a forward-looking model-based assessment to reach a more comprehensive picture on the potential impact of climate change on asset prices.[10] Historic data might not be fully informative about the dynamic materialization of environmental externalities

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[7] EIOPA (2022b).

[8] For instance, Bolton and Kacperczyk (2021); Carbone et al. (2021); EIOPA (2020a).

[9] For example, the economic activities mentioned as Climate Policy Relevant Sectors (CPRS) by Battiston et al. (2017) to capture transition risk exposure are typically associated with high greenhouse gas emission levels: fossil fuel- related activities, utility and energy-intensive activities, buildings, transportation and agriculture.

[10] See also on the need for a forward-looking assessment: NGFS (2022b).

in asset prices, as sustainable finance gained profound attention on capital markets rather recently in the last decades. In addition to this, the weight put on such externalities might vary as capital markets seem to price them in more strongly in times of high public attention to climate change, e.g. related to natural catastrophe events or international treaty agreements like at COP 21 in Paris in 2015. For example, Ilhan et al. (2021) show that carbon-related tail risk is perceived to be higher in times of high public attention to climate change.[11] Therefore, a forward-looking analysis can be used to cross-check and validate findings from the historical time-series analysis and provide further insights in the potential impact of transition risks on asset prices.

17. At this stage, EIOPA does not study the physical risk exposure of investments due to the substantial lack of appropriate data needed for an appropriate risk-based analysis. In particular, granular data on the exact geolocation of a firm's facilities is needed to link the firm's financial performance to its widespread climate-related physical risk exposures. Moreover, data is needed on a firm's physical risk mitigation approaches (e.g. flood protection measures) and the use of insurance products to compensate for financial losses due to business interruption. These factors can substantially influence a firm's cash flows and thereby the associated market risks. Data currently available is typically missing the granularity needed, which prevents an appropriate analysis of the impact of physical risk on asset prices.

Assets and Transition Risk Exposures – Summary of the Chapter

18. The chapter starts with describing the proposed classification approach of stocks and bonds according to their transition risk exposure. In this regard, the first section discusses the availability and potential to use publicly available market indices for the analysis. As the currently available indices appear to be insufficient for the proposed analysis, the chapter introduces two general risk classification approaches regarding the potential exposure of stocks and bonds to transition risk. The first approach is based on the economic activity of a company as a determinant for transition risk (sectoral approach), while the second approach is based on company-specific environmental variables, for instance in terms of a company's level of greenhouse gas emissions. Different portfolios of bonds and stocks can then be constructed based on the correspondingly associated transition risk exposure. Regarding the quantitative risk assessment to analyse potential transition risk-related differences in bond spreads and equity returns, the discussion paper describes the methodologies relevant from a Solvency II perspective and discusses potential data sources for calibration purposes. Regarding property risk, the corresponding section discusses a building's level of energy efficiency as a key determinant for transition risk on the housing market and introduces a risk classification approach of buildings based on energy performance certificates. The section continues with

[11] Ilhan et al. (2021).

describing the proposed methodology for the analysis, focusing on constructing price indices for comparable buildings based on energy performance certificates to assess potential differences in property risk related to a building's level of energy efficiency, and discusses potential data sources for calibration purposes. The chapter ends with describing the proposed methodology for a forward-looking model-based assessment as extension to the backward-looking approach.

Underwriting Risks and Climate Change Adaptation - Motivation

19. In its discussion paper on physical risks related to climate change, EIOPA assesses the exposure of property, content and business interruption insurance against climate change, showing the tremendous levels of claims related to recent natural catastrophes.[12]
20. As climate change is expected to substantially increase the physical underwriting risk exposures in certain non-life insurance business lines over time, risk-based premium levels are expected to increase substantially as well, which could impair the long-term affordability and availability of insurance products with coverage against climate-related hazards.
21. Climate change adaptation in terms of risk prevention constitutes an important environmental objective in light of climate change, which is underlined by the consideration of non-life insurance as a taxonomy eligible activity.[13] In its work on impact underwriting, EIOPA focuses on the potential for insurance undertakings to contribute to the adaptation of societies and economies to climate change by means of their underwriting practices.[14]
22. In this regard, climate-related adaptation measures implemented ex-ante to a loss event, for example water-resistant walls or doors in case of flood risks, can reduce the policyholder's physical risk exposure and insured losses. Therefore, adaptation measures can be a key forward-looking tool to maintain the long-term provision of non-life insurance coverage in light of climate change. Growing evidence in the literature underlines the effectiveness of risk prevention measures in reducing loss exposures related to climate change.[15]
23. Therefore, as the second main area of analysis, EIOPA focuses on the potential for a dedicated prudential treatment of climate-related adaptation measures on non-life underwriting risks in Solvency II's Standard Formula. If climate-related adaptation measures lead to a difference in the prudential risks for insurance products with and without these measures, risk-based capital requirements should recognize the resulting risk differential. Specifically, at this stage of the analysis, EIOPA conducted a dedicated underwriting data collection in the second quarter of

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[12] EIOPA (2022a).

[13] Commission Delegated Regulation (EU) 2021/2139.

[14] EIOPA (2021a).

[15] For instance, Hudson et al. (2016); Kreibich et al. (2011); Kreibich et al. (2005).

2022 to quantitatively study the influence of climate-related adaptation measures on premium risk. A qualitative survey accompanying the data collection enables to start assessing the potential influence on reserve risk and natural catastrophe risk.

Underwriting Risks and Climate Change Adaptation - Summary of the Chapter

24. The chapter starts with introducing the role of climate-related adaptation measures for non-life insurance and highlights the conceptual distinction to climate-related mitigation measures. It then set out the prudential hypotheses on the potential influence of climate-related adaptation measures on underwriting risk in terms of premium risk, reserve risk and natural catastrophe risk. In order to show the potential effect of climate-related adaptation measures on physical risk exposures from a general perspective, the chapter outlines three dedicated case studies to further motivate the topic. The chapter ends with outlining the proposed methodology for a prudential risk assessment, thereby focusing on premium risk. In this regard, the proposed methodology aims at comparing the premium risk of similar underwriting pools with and without climate-related adaptation measures in order to assess the potential for a change in the standard deviation parameter for premium risk resulting from the implementation of the adaptation measures.

Social Objectives and Social Risks from a Prudential Perspective - Motivation

25. The third area of analysis focuses on the prudential treatment of social risks and objectives under Solvency II. As a starting point, it is helpful to compare to what extent the existing framework for the measurement and prudential treatment of climate risks and objectives can be transposed to the analysis of the prudential treatment for social risks and objectives. Social risk factors can have prudential consequences on undertakings' assets and liabilities in a conceptually similar manner to environmental risk factors. But not all concepts and prudential measures from climate analysis may apply in a similar manner to social aspects (e.g. potential requirements for scenario analysis or quantitative prudential reporting).
26. Risks associated with socially harmful activities, for instance violations of labour and human rights, could materialize in direct financial losses regarding the investment and underwriting activities of insurance undertakings, besides reputational risks for the undertakings.
27. To translate harm to social objectives, or external social risks into prudential risks, however, requires relevant quantitative evidence in order to form an appropriate risk-based assessment of the financial impact of social risk factors.
28. Such evidence is currently lacking, mainly as a result of the difficulty to define and measure objectively and consistently the 'social' element of environmental, social and governance (ESG) issues. This is due to both issues of scope – defining which stakeholders are impacted – and measuring outcomes and benefits. Social aspects of investing, for example, are often broadly identified with 'societal values', relating to investors' moral values and beliefs. Social matters

also depend on national social legislation or industry relations. Social and labour law are not within EU competence as such, but under national competence. Hence many aspects of social factors, such as working conditions, are not defined at EU level and national rules might diverge.

29. While progress is being made, as for example under the requirements of the Sustainable Finance Disclosure Regulation (SFDR), at this stage, EIOPA intends to outline the prudential treatment of social risks from a Pillar II and III perspective as part of the amended Solvency II Delegated Regulation, focusing on governance and risk management as well as reporting and disclosure requirements.

Social Objectives and Social Risks from a Prudential Perspective - Summary of the Chapter

30. The chapter starts with presenting working definitions of social objectives and social risks and discusses how social risks or harm to social objectives can translate into prudential risks through insurance undertakings' investment and underwriting activities. Following the double materiality principle, the chapter discusses how mitigation and adaptation measures may potentially reduce risk exposures related to social factors. The corresponding prudential treatment is outlined as regards to the current Solvency II requirements on governance and risk management as well as reporting and disclosure.

2. ASSETS AND TRANSITION RISK EXPOSURES

31. In light of the current status of discussion in the scientific literature related to sustainable finance and under consideration of the still limited availability and granularity of ESG-related data, EIOPA considers the asset classes of stocks, bonds and property investments to be most relevant for an assessment of the potential for a dedicated prudential treatment regarding transition risk. These three asset classes are also the most relevant ones for insurance undertakings' investment decision.
32. The proposed analysis in this discussion paper uses historical asset prices as the basis for a corresponding prudential risk assessment (backward-looking perspective). Generally, the proposed analysis uses historical asset prices to assess if significant risk differences between suitably defined asset portfolios exposed to different levels of transition risk can be observed.
33. As historic time series data might insufficiently capture the materialization of transition risk in asset prices, EIOPA proposes to extent the backward-looking analysis with a forward-looking and model-based approach to cross-check findings and gain further insights. Sections 2.1 to 2.6 discuss potential backward-looking approaches for stocks, bonds and property, and Section 2.7 discusses the forward-looking approach.
34. The definition of potential asset portfolios follows the purpose of the analysis, which is to assess whether any changes to regulatory capital requirements to differentiate based on the assets' transition risk exposures could be justified based on evidence. This purpose leads all elements of the analysis (e.g. choice of risk measure, measurement of transition risk and definition of portfolios) and means for example that portfolios should be defined based on objective criteria, which are not too costly to check.
35. An obvious possible starting point of the analysis are existing market indices, which consider sustainability factors, as explained in Section 2.2. In particular, capital markets offer a large variety of debt and equity indices compared to property indices. However, using market indices has several material limitations regarding the intended analysis. For instance, market indices currently available typically aim to track the price behaviour of environmentally friendly firms, whereas indices tracking environmentally harmful firms, e.g. based on their greenhouse gas emissions, are largely missing.
36. It is therefore necessary to define dedicated asset portfolios associated with different levels of transition risk exposures for the purpose of this analysis. In this regard, several general decisions need to be taken:

    - Selection of measures for transition risk
    - Definition of relevant asset portfolios in terms of the level of transition risk

- For stocks and bonds: Selection of firms from which portfolios are built
- Quantification of transition risk for selected firms
- Cleaning of data
- Calculation of the portfolio returns
- Selection of prudential risk measures

37. The following sections describe the possible options for each of these items. The chapter starts with a summary of the advantages and disadvantages of an analysis based on historic asset prices for stocks and bonds. This is followed by a description of the relevant criteria that could be used to select existing equity or debt indices on capital markets that consider sustainability factors and the potential indices that have been identified so far.
38. Subsequently, a potential approach regarding the construction of suitable equity and debt portfolios is described. In a first step it is discussed how the degree of transition risk for a company could be measured. The second step is then a description of possible asset portfolios that are based on this transition risk measure, and how a prudential risk assessment can be undertaken.
39. As the analysis of the impact of transition risk on the value of properties requires a different approach compared to the analysis of stocks and bonds, Section 2.6 describes the corresponding methodology. Section 2.7 describes a potential approach to conduct a forward-looking approach on the impact of transition risk on asset risk exposures.

2.1. GENERAL DATA REQUIREMENTS FOR STOCKS AND BONDS

40. There seem to be good reasons for looking at the risk of investments in the past: While historical data may be selected and interpreted in different ways, it is less subjective than forecasts. It can also provide an indication about the potential range of future outcomes on the impact of transition risk on asset prices.
41. However, there are also limitations: Historical asset prices do not properly reflect future changes in the environment (e.g. the future effects of measures against climate change). But also, the effects of past environmental-related changes do not necessarily appear to the full extent in past data: The Solvency II risk measurement and calibration is driven by periods of economic crises. The one major crisis since the signing of the Paris Agreement in 2015 was the COVID-19 crisis with substantial effects on the capital markets particularly in 2020-21. While its effects were tragic from a human perspective and very significant for all economies, its effects on financial markets were less severe than the Global Financial Crisis from 2007-09. This means that historical market data may not fully reflect the transition risk-related exposure of individual

investments in the post Paris agreement period in a 99.5% stress event used for calibration purposes. For these reasons it is important to complement the backward-looking assessment with a forward-looking one to achieve a comprehensive scope of analysis.

42. EIOPA considers the backward-looking analysis in terms of historic asset price data as the basis for a prudential assessment of transition risk. One possible data source to be used are historical prices for listed equities and historical spreads for traded bonds. This fits best with the measurement of market risks under Solvency II as fluctuations in fair values and data are in principle available for each trading day.
43. Alternatively, historical data for non-listed equity and non-traded debt could be used, avoiding a bias in the analysis towards more established and mature companies. It would potentially also allow to capture more specifically firms that develop new technologies to fight climate change which are not yet listed on capital markets.
44. While desirable to cover other segments, the use of non-market data creates also challenges: Firstly, data is only available for certain points in time (e.g. quarterly in the case of net asset values). Secondly, valuations include a subjective element due to expert judgement. Thirdly, if no valuations are available, one has to derive them based on e.g. cash-flow data and pricing models, which require subjective assumptions.
45. Generally, there is the fundamental question whether companies developing new technologies that benefit society in light of climate change exhibit lower risk for debt and equity investors. Prima facie, due to the underlying technological and market uncertainty, the risk profile of these non-listed companies could be similar to Venture Capital firms.

Questions to stakeholders

Q1: Are there any specific data sources that might be useful for a historical analysis of transition risk for private and public equity and debt? How can EIOPA access them? Why are they relevant?

Q2: In case you are suggesting the use of historical “non-valuation data” like cash flows: How would the measurement of risk be commensurate with the definition under Solvency II (i.e. fluctuation of values in accordance with Article 75)?

2.2. ANALYSIS OF MARKET INDICES FOR STOCKS AND BONDS

46. Using existing indices would be the simplest way to assess potential transition risk differentials. In contrast to self-defined portfolios, the data is readily available. Moreover, the assessment of sustainability for existing indices has necessarily a higher level of sophistication than the approximations that are unavoidable for self-defined portfolios. This should make it easier to detect transition risk differentials if they exist. Finally, the analysis of measures used by index

providers can help in devising metrics for self-defined portfolios. There is, after all, no need to reinvent the wheel.

47. On the other hand, market indices typically differ substantially regarding their methodologies, e.g. in terms of ESG-related criteria and their index weighting. Therefore, findings derived on market indices should be interpreted carefully for the purposes of a prudential risk assessment.

2.2.1. GENERAL CONSIDERATIONS

48. The selection of appropriate market indices for the analysis could consider the following aspects.
49. The geographical scope of assets: The original equity calibration under Solvency II used the MSCI World Index. This would suggest to use environmentally-related equity indices that cover all developed markets (i.e. World indices). On the other hand, EEA insurers invest primarily in European companies. This would suggest to use European or even Euro area equity indices. One could also make an argument that the European Union takes a more decisive approach to preventing climate change than other jurisdictions. If one follows this argument, transition risks may have materialized to a larger extent in the historical equity prices of European companies. The debt calibration under Solvency II was based on bonds from European bond indices. This and the primacy of local debt instruments in the portfolios of European insurers would suggest the use of European debt indices.
50. Size of companies: The companies included in the environmentally-related debt and equity indices should represent a meaningful investment volume. For this reason and because the original Solvency II calibration was based on large companies, large cap indices are a possible choice. At the same time this introduces a bias in the analysis towards more established, mature companies.
51. Type of index: For equity assets, both price and total return indices seem appropriate choices for the intended analysis. For debt assets, the situation is more difficult as their risk depends also on rating and duration. Indices which provide spreads for different ratings and maturities seem therefore the most suitable ones.
52. Available time period: The index values should be available for a sufficiently long period of time. The calibrations for equities and corporate bonds suggested by CEIOPS also reflected data from the Global Financial Crisis 2007-09. On this basis indices that started in 2007 or before seem to be the best suited for the intended analysis.
53. Type of sustainability criteria: The indices should consider measures for transition risk in their construction methodology. Current ESG-related indices typically incorporate in addition to environmental considerations also social and governmental aspects. Based on the proposed focus of the analysis on transition risk, these “multi-factor” indices seem therefore less suited.
54. Level of transition risk exposure: Indices with a differentiation in the level of transition risk exposures for the assets would be most useful. Of particular interest for the analysis are indices

tracking companies on both sides of the transition risk exposure: firms that are not or only moderately affected by transition risk and firms that are substantially affected by transition risk.

55. Weight of sustainability criteria: Based on the information currently available to EIOPA, there seem to be no indices for which the weight of their constituents is determined exclusively based on sustainability factors. The starting point are normally market weights, which are then adjusted to incorporate sustainability considerations. The resulting deviation from the reference index varies. Proximity to the reference indices in terms of countries, sectors and size of the companies might make it easier to isolate the effect of transition risk on the observed price deviations. Indices with a larger deviation can however also be useful as the transition risk does vary between sectors and differences in transition risk have a larger impact on the composition.

Question to stakeholders

Q3: Do you have comments on the outlined criteria for the selection of market indices?

2.2.2. SELECTION OF MARKET INDICES

Equities

56. For equities, the focus of EIOPA's work so far has been on the sustainability indices provided by MSCI, as it facilitates the comparison with the equity risk charges calibrated in Solvency II that have been based on MSCI indices. An initial look at indices from other providers suggests no fundamentally different conceptual methodologies.
57. Based on the criteria mentioned in the previous sub-chapter, EIOPA has so far identified the following MSCI Indices as possible candidates for a further analysis: MSCI World Climate Change, World Climate Paris Aligned, World Low Carbon Target and World Global Environment. The latter index comprises companies that derive at least 50% of revenues from environmentally beneficial products and services.
58. While ESG-related indices have been available for quite some time, it seems that indices which focus exclusively on environmental aspects are a more recent innovation. Index data for the first three indices mentioned is only available from 2013 onwards.
59. All selected indices use different measures of transition risk. The Climate Paris Aligned Index has the particularly appealing feature that it seems best aligned with the EU Taxonomy. Table 1 shows the 12-month empirical 99.5% Value-at-Risk based on overlapping windows for the period between 2013 and 2021. As reference the value for the MSCI World Index is provided.

Table 1: VaR of Selected Market Indices [2013-2021]

MSCI World	MSCI World Climate Change	MSCI World Climate Paris Aligned	MSCI World Low Carbon Target Index
15.85%	12.01%	11.82%	13.18%

Source: Own Table.

Questions to stakeholders

Q4: Are there any equity indices not mentioned above that would be relevant to analyze? Why?

Q5: Are there any equity indices which focus on companies with higher transition risk?

Q6: Would you have any suggestions how the effect of different levels of transition risk could be "isolated" when comparing the historical risk for a given index with the broad market?

Bonds

60. Regarding bonds, it seems that indices which use exclusively environmental criteria have been introduced only relatively recently. EIOPA has so far identified the following indices as possibly relevant for the analysis regarding transition risk: MSCI EUR IG Climate Paris Aligned Corporate Bond Index, MSCI USD IG Climate Paris Aligned Corporate Bond Index, MSCI EUR IG Climate Change Corporate Bond Index, MSCI USD IG Climate Change Corporate Bond Index, Solactive ISS Paris Aligned Select Euro Corporate IG Index and Solactive Paris Aligned Global Corporate Index.

Questions to stakeholders

Q7: Are there any other bond indices suitable for the analysis? Why?

Q8: Are you aware of any indices which focus on companies with higher transition risk?

Q9: Would you have any suggestions how the effect of different levels of transition risk could be "isolated" when comparing the historical risk for a given index with the broad market?

Q10: Would you have any suggestions how to compare the risk of a given bond price index (i.e. no separate spread data for each rating class and maturity buckets available) with a "conventional" bond index taking into account possible differences in ratings and durations?

2.3. CLASSIFICATION OF EQUITY AND DEBT PORTFOLIOS

61. The use of existing market indices has several advantages, but the portfolios for which historical risk can be analysed are pre-defined as well as the methods for measuring transition risk. Moreover, dedicated indices capturing the price behaviour of firms associated with higher transition risk exposures are largely missing. Therefore, it will be necessary to construct for EIOPA's proposed analysis portfolios of debt and equity issued by companies subject to different levels of transition risk. This section sets out how the general approach for their construction could look like. It starts with a discussion how to measure the degree of transition risk a company is exposed to. The second step is then the definition of suitable portfolios based on this measure.
62. Both steps are interlinked: If for each company the only information available was whether it has above or below average transition risk, then only two portfolios with different transition risks could be formed. If one starts instead with the aim to form only two portfolios, then measurement of transition risk on a nominal scale is sufficient (instead of for example on an interval scale).
63. All choices have to be based on the aim of the analysis, which is to establish whether changes to the regulatory framework might be justified. If the chosen portfolios displayed a very different risk behaviour, then one might consider introducing different capital requirements for companies that meet the conditions for inclusion in these portfolios. Their selection has therefore to take into account implementation considerations. As a result of the need to strike a balance between accuracy and complexity, in Solvency II there is often the same treatment for broad categories of investments, e.g. the same treatment for all equities listed in EEA and OECD countries (Type 1 equity). This is an argument against defining a large number of dedicated portfolios for the purpose of the analysis (e.g. "very high transition risk", "high transition risk", "medium transition risk", etc.). From a regulatory efficiency perspective, it also makes little sense to analyse risk differences for portfolios which represent only a miniscule part of the portfolio of insurers, unless the differences in risk are significant.
64. It might be necessary to revise the initially defined portfolios based on the results for their historical risk (i.e. this is an iterative process). If for example different portfolios with an above average transition risk display only slight differences in terms of their historical risk, then it would make no sense to introduce a differentiated capital treatment for all of them. Instead, one should combine them.

2.3.1. MEASUREMENT OF TRANSITION RISK

65. A fundamental question is how to measure the exposure of companies to transition risk. Based on the analysis so far EIOPA has identified two general approaches:

a. The level of transition risk is predominantly determined by the economic sector in which the company operates ("sectoral approach").
b. The measurement has to take into account company specifics other than the economic sector ("individual company approach").

66. There are different possibilities to define economic sectors, for example based on NACE codes or the Global Industry Classification Standard (GICS) classification.[16] For instance, research by Teske et al. (2022) shows the need for substantial sectoral emission cuts to limit climate change, which can be considered as main determinant for transition risk for these sectors.[17]
67. Based on the "individual company approach", a company operating in a sector with high average transition risk could be assigned a lower transition risk. Possible measures for company specific transition risk could be the proportion of taxonomy-aligned revenues, ESG ratings (or E-scores), greenhouse gas emission levels. For instance, work by Bolton and Kacperczyk (2021) or Carbone et al. (2021) use its level of greenhouse gas emission as proxy for the transition risk exposure of a firm.[18]
68. The measurement of transition risk for both approaches is discussed in more detail in the following sub-sections.

Question to stakeholders

Q11: Do you see any other possible approach to classify stocks and bonds according to their transition risk exposure? What would be their advantages?

Possible Measures of Sector-Specific Transition Risk

69. Under the sectoral approach companies within the same sector are assumed to have the same level of transition risk.
70. This section discusses the possible risk measurement based on sectors defined by NACE codes. This approach allows a very granular definition of sectors and the use of the existing substantive work on transition risk based on NACE codes. Similar issues would also have to be solved for any other sectoral definition.
71. Several stress test exercise and studies have already looked at the exposure of activities with different NACE codes to transition risk. These include: EIOPA (2022c), EIOPA (2022d), ACPR (2021), ECB (2021a), EIOPA (2020a), BoE (2019), DNB (2018) and Battiston et al. (2017).

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[16] For details on the GICS, see MSCI (2022).

[17] Teske et al. (2022).

[18] For instance, Bolton and Kacperczyk (2021); Carbone et al. (2021); EIOPA (2020a).

72. Work by Battiston et al. (2017) identifies climate policy relevant sectors (CPRS). These are sectors that are subject to a higher level of transition risk exposure. The approach determines the level of transition risk based on greenhouse gas emissions, the role of the sector in the energy supply chain, and the existence of climate policy institutions in countries. There is no differentiation between the remaining NACE code sectors. There is also no ranking in terms of transition risk for the identified climate policy relevant sectors.
73. In line with their purpose to quantify the effect of transition and/or physical risk materialising on the financial position of regulated entities, stress test exercises do normally not define categories of transition risk. They provide however shocks for equity and debt prices.
74. These shocks could be interpreted as measure for transition risk. This approach allows the ranking of NACE codes with respect to their transition risk exposure. In principle both equity and debt shocks could be used to measure transition risk. It seems though undesirable to have different measures of transition risks for debt and equity. In the following equity price shocks are used to illustrate how portfolios could be defined.
75. By defining threshold values, one could also define categories with higher, medium and lower transition risk. While the specific values for the shocks between the stress test exercises vary (e.g. depending on the time horizon), there is some degree of consistency in terms of the resulting sector rankings.
76. Based on the Battiston et al. (2017) paper, two categories for sectors can be defined: Higher transition risk sectors and a category for residual sectors. The stress test data allows to define multiple categories. What is worth noting is that the sectors with the highest equity price shocks are to a large part included in the climate policy relevant sectors as defined by Battiston et al. (2017).[19]

Questions to stakeholders

Q12: Would you have other ideas how to quantify transition risk per NACE code?

Q13: Would you have suggestions for sector definitions other than by NACE code? What are their advantages? How does one quantify their transition risk?

Q14: Do you agree that either the debt or equity shocks from recent stress test exercises should be used for measuring transition risk (resulting in one measure for both asset classes)? What advantages do you see in using equity or debt shocks respectively?

[19] The sectors with the highest double shock in DNB (2018) are: B5 to B9 (100%), D35 (99%), C19 (56%), H50 (37%), C23 (27%), H51 (22%) and C24 (21%). Of these only the following NACE codes are not included in the Battiston et al. (2017) climate policy relevant sectors: B7.21, B8.1, B9.9, D35.3, C23.9.9, C24.3.2, C24.3.3, C24.3.4, C24.5.2 and C24.5.4.

Possible Measures of Company-Specific Transition Risk

77. In this regard, different approaches are possible.

Use of EU Taxonomy Data

78. The use of EU Taxonomy data would have several advantages: 1) the use of an existing framework for the purpose of measuring sustainability instead of developing something new; 2) there would be an alignment within the EU regulatory framework; 3) it would allow to classify firms on the basis of their effective contribution to one of the EU environmental objectives, avoiding the need to rely on proxy variables (e.g. GHG emissions); 4) if there were a change to the regulatory capital requirements to reflect transition risk, the taxonomy would provide, at least for EU companies the necessary information to decide about the treatment of investments.
79. The first major drawback at the moment is that the necessary taxonomy-related data will only become available in the future.[20] Moreover, regarding environmental objectives, the EU Taxonomy provides criteria for environmentally friendly economic activities (typically associated with moderate levels of transition risk), but not for environmentally harmful activities (typically associated with high levels of transition risk), which would be needed to study the full scope of transition risk exposures. Consequently, this approach seems not feasible at this stage for the purpose of the analysis.

Use of ESG Ratings and Environmental Scores

80. An alternative could be the use of ESG ratings assigned by external providers; given the focus on transition risk one possibility would be to use only the environmental scores which enter into the determination of the overall ESG rating. This would allow to discard social and governance factors for the purpose of the analysis. Depending on the format of the environmental score this approach would also have the advantage that there is no need to define thresholds to divide firms into different buckets. Instead, buckets defined by ESG-rating providers (e.g. A, B, C, etc.) could be used directly. Of course, the underlying assumption in this approach would be that the "pre-defined" buckets are appropriate for the specific task.
81. One challenge in the use of environmental scores would be the substantial divergence of ESG ratings among the different providers that has been observed.[21] Consequently, results and

[20] A first partial disclosure based on the taxonomy is expected in the course of 2022 covering the financial year 2021. The delegated acts already published are concerning only climate change adaptation and mitigation environmental objectives. The delegated acts dedicated to technical screening criteria for the other environmental objectives of the taxonomy are supposed to be adopted by the end of 2022 and data disclosed based on those complementary specifications is expected in the course of 2023 covering the financial year 2022. As a result a complete set of data based on the taxonomy will not be available until the second semester of 2023. In addition, it is possible that a consistent and complete set of data will not be available at this time as their production is also dependent on the adoption of the revised non-financial reporting framework and its technical specification still under discussion.

[21] See, e.g. Berg et al. (2019).

conclusions may vary considerably depending on the chosen rating. As such, environmental scores may therefore not be an adequate proxy for transition risk.

82. Another aspect to consider is whether the environmental scores measure risk on an absolute or a relative basis. Environmental scores may measure the *relative* environmental impact compared with other companies in the same industry sector. This might be useful for measuring the impact of transition risk on the historically observed risk, e.g. when comparing the risk for steel producers with different environmental scores. At the same time, the transition risk for the steel producer with the highest environmental score may still be substantially above the level for a services company with an average score.
83. Further consideration is also necessary with respect to the actual environmental score to be used. There might be a single one which combines different aspects like resource usage, greenhouse gas emissions, production of waste, etc. There might also be different scores available for each of all potential environmental dimensions.

Use of Emission Intensity Ratios

84. Another possible proxy for transition risk could be the greenhouse gas emission (GHG) at firm-level.
85. In this case several questions arise: The first one is whether to use absolute GHG emission levels or GHG emission intensities (i.e. GHG emissions scaled by revenues/profit, etc.). The use of absolute emissions allows to identify more carbon intensive firms while the use of emission intensities avoids the bias resulting from large firms having higher emissions due to the scale of their operations. The latter might also be better suited to capture the vulnerability of a company to higher costs for producing emissions.[22] Consequently, GHG emission intensities may be more adequate to measure transition risk.
86. The second question is whether to use a wider definition of emissions (scope 2 or 3) or only direct emissions (scope 1).[23] On the one hand, the profitability and consequently the value of the debt and equity issued by the company might also be negatively affected by higher costs or restrictions for the emissions included in scope 2 and 3 (perhaps to a lesser degree). On the other hand, scope 3 emissions are difficult to estimate and not available for all firms. [24]

[22] Other things being equal if two companies produce the same amount of emissions the one with lower profits should be more vulnerable to higher emission costs.

[23] Scope 1 emissions are direct emissions of the firm; scope 2 are indirect emissions associated with the use of energy sources in the production process; scope 3 are indirect emissions that occur in the value chain of the firm (both upstream and downstream).

[24] A recent working paper by Carbone et al. (2021) found a statistically significant negative relationship between scope 1 GHG emissions and credit ratings, while no relation for scope 2 emissions and only a weak relationship for scope 3 emissions was found.

87. In case profits instead of revenues are used to determine emission intensities a third question is whether the current profits or normalised profits should be used.[25]

Use of Additional Variables Measuring the Change in Emissions

88. Instead of estimating the transition risk of individual firms by a single variable (e.g. GHG emissions) one could also use a set of variables. GHG emissions (be it absolute levels or intensities) reflect the current carbon footprint and, thus, measure the current exposure to transition risk. However, there might be further factors affecting transition risk, such as the firm's success in reducing emissions in the past or the existence of a credible plan to reduce emissions in the future. To take these factors into account, additional variables may be considered. One could be the change in GHG emissions in absolute (levels) and/or relative (intensities) terms in a given time period (for example since the Paris Agreement until today). This variable would capture the firms' past performance in reducing GHG emissions.
89. To assess the existence of firms' plans to reduce greenhouse gas emissions in the future, the following forward-looking variables could be used: [26]
    - dummy variable indicating whether a firm discloses a forward-looking commitment to reduce GHG emissions;
    - percentage by which the firm commits to reduce GHG emissions: the higher the percentage, the more ambitious the commitment to reduce emissions;
    - number of years until reaching the target year by which the firm commits to reduce GHG emissions: the shorter the period, the stronger the commitment.
90. While it might be desirable to look also at changes, there are at least two challenges. Firstly, in case the aim is to aggregate the variables to a single measure, there is the question how they should be weighted. Secondly, in case of a dynamic measurement of transition risk (i.e. regular reallocation of the portfolio's constituents, see Section 2.4.2) it might be difficult to retrieve the relevant historical data (at least if commitment by firms are to be used).

[25] In contrast to revenues the profit can fluctuate significantly from year to year. Instead of the current profit one could for example use the average over the past five years.

[26] The set of variables identified in the following has been used in Carbone et al. (2021).

Questions to stakeholders

Q15: Do you have any comments on the company-specific transition risk measures set out in this chapter? Are there other ones? If so, what are their advantages?

Q16: Do you agree with focusing on greenhouse gas (GHG) emission intensities rather than on absolute GHG emissions? What is your view regarding the scope of emissions to be used (1, 2 or 3)?

2.3.2. DEFINITION OF RELEVANT ASSET PORTFOLIOS

2.3.2.1. Sectoral Approach

91. Based on NACE codes, different asset portfolios can be defined. Possible examples are set out in the following.
92. As set out below one option would be to define two or three asset portfolios with stocks and bonds from companies subject to higher, lower and possibly medium transition risk.

Three Portfolios: High, Medium and Low Transition Risk Exposure

93. One possibility would be to define economic sectors associated with higher transition risk exposures as the climate policy relevant sectors (CPRS) introduced by Battiston et al. (2017): fossil-fuel, utility/electricity, energy-intensive, buildings, transportation, and agriculture. The CPRS are widely accepted and provide high granularity for the included NACE codes.[27] The CPRS are also typically associated with high levels of greenhouse gas emissions.
94. In order to define the group of economic sectors associated with lower or medium levels of transition risk exposures, the debt or equity shocks from the DNB transition risk stress test could provide the basis for the definition of the two corresponding asset portfolios.
95. The DNB transition risk stress test provides the shocks to debt and equity prices for different scenarios in which transition risk materialises at the level of second digit NACE codes.[28] An argument for the use of values in the double shock scenario could be that it is the most severe one under the constraint that the equity shock is spread heterogeneously across different economic sectors. Then, sectors with shocks below a certain (arbitrary) threshold level could be classified as relatively low transition risk sectors.
96. Once sectors with higher and lower transition risk exposure have been defined, the sectors with medium transition risk exposure are simply the remaining ones.

[27] CPRS-sectors are used as reference in i) EIOPA's ORSA application guidance on climate scenarios (EIOPA (2022b)) and ii) EIOPA's Sensitivity Analysis for Transition Risk (EIOPA (2020a)).

[28] DNB (2018).

97. An alternative to equating higher transition risk with the CPRS by Battiston et al. (2017) would be to define all portfolios based on the debt or equity shocks related to the DNB stress test alone. In this case one has to define two (arbitrary) threshold levels to separate the economic sectors associated with higher transition risk exposures from the medium ones and the medium ones from the sectors with lower levels of transition risk sectors.

Two Portfolios: High and Low Transition Risk Exposure

98. In case of only two portfolios (higher and lower transition risk) there are at least two possibilities: Firstly, the higher transition risk asset portfolio is defined as outlined above based on the CPRS by Battiston et al. (2017). Then the remaining sectors constitute the lower transition risk portfolio. Secondly, the DNB stress test factors and a single threshold level are used to separate economic sectors into two buckets, i.e. lower and higher transition risk sectors.

Illustration of Asset Portfolios

99. In order to illustrate possible asset portfolios, Table 2 sets out the values for the equity double shocks in the second column in descending order and in the third column the corresponding NACE codes. This allows to see which NACE code sectors would fall into the lower and higher transition risk category depending on the selected thresholds.

100. The table can be read as following: Assume for example that the higher transition risk sectors were to be defined as those with a double shock of at least 9%. Then the higher transition risk NACE codes would be those in the rows 1 to 20. If one defined in addition the lower transition risk sectors as those with a double shock not higher than 4% then these sectors could be found in the rows 40 to 87. The neutral ones would be those in the middle (rows 21 to 39). The columns "Overlap 1" and "Overlap 2" provide information to what extent the definitions of higher transition risk sectors based on the CPRS (Battiston et al. (2017)) and sectors based on equity shocks would coincide. If for instance a threshold of 9% was chosen, then 85% of the so defined higher transition risk NACE code sectors would be also CPRS sectors. At the same time for 44% of the CPRS sectors the combined equity shock is 9% or higher.

101. One limiting factor in the comparison between the results for the two approaches to define sectors with higher transition risk is the different granularity (4-digit NACE code level for CPRS sectors by Battiston et al. (2017) and 2-digit NACE code level for the DNB stress test sectors). For the calculation of the overlap, one needs therefore to decide whether a 2-digit NACE code should be considered as included in the CPRS or not. As an example, according to the table 80% of the sectors with a combined equity shock of 100% (B5 to B9) are CPRS. But the only 3digit NACE codes not included are actually B7.21, B8.1 and B9.9.

Table 2: Effect of threshold on composition of portfolios with higher, medium and lower transition risk

Row	Double shock	NACE	Overlap 1	Overlap 2	Row	Double shock	NACE	Overlap 1	Overlap 2
1		B5			45	-3%	G47	59%	90%
2		B6			46		N77		
3	-100%	B7	80%	10%	47		N78		
4		B8			48		N79		
5		B9			49		N80		
6	-99%	D35	83%	13%	50		N81		
7	-56%	C19	86%	15%	51		N82		
8	-37%	H50	88%	18%	52		O84		
9	-27%	C23	89%	21%	53		R90		
10	-22%	H51	90%	23%	54		R91		
11	-21%	C24	91%	26%	55		R92		
12	-16%	C22	92%	28%	56		R93		
13		C31			57		S94		
14		C32			58		S95		
15	-12%	F41	88%	38%	59		S96		
16		F42			60	-2%	C18	45%	95%
17		F43			61		G45		
18		E37			62		G46		
19	-9%	E38	85%	44%	63		I55		
20		E39			64		I56		
21	-8%	C21	86%	49%	65		J58		
22		E36			66		J59		
23		C17			67		J60		
24		C20			68		J62		
25	-7%	C27	85%	59%	69		J63		
26		C28			70		K65		
27		C33			71		K66		
28		A2			72		M69		
29		A3			73		M70		
30		C13			74		M71		
31		C14			75		M73		
32	-6%	C15	83%	77%	76		M74		
33		C16			77		M75		
34		C25			78		P85		
35		C29			79		Q86		
36		C30			80		Q87		
37		C26			81		Q88		
38	-5%	H49	82%	82%	82		T97		
39		M72			83		T98		
40		A1			84	-1%	H53	45%	100%
41		C10			85		J61		
42	-4%	C11	80%	90%	86		K64		
43		C12			87		L68		
44		H52							

Source: Own Table.

102. Table 3 sets out the percentage of NACE codes in the lower, medium and higher transition risk portfolios for different values of the threshold.

Table 3: Percentage of NACE codes in the lower, medium and higher transition risk portfolios

	Threshold			
	5%	4%	3%	2%
Percentage of Lower Transition Risk NACE Codes	45.2%	44.5%	40.7%	24.0%
Percentage of Medium Transition Risk NACE Codes	9.0%	9.6%	13.5%	30.2%
Percentage of Higher Transition Risk NACE Codes	45.9%	45.9%	45.9%	45.9%

Source: Own Table.

103. There could be different ways to test the robustness of the definitions. An obvious possibility would be to perform a sensitivity analysis by comparing the results for portfolios based on varying threshold values.

104. Another topic is the treatment of financial institutions (e.g. banks, insurers). They are not included in the CPRS by Battiston et al. (2017) and their equity stress in the DNB exercise is only -1% for the combined shock. This means that, according to the approach above, they would fall into the lower transition risk category.[29] As bonds and equities issued by financial institutions show a substantially above average risk in a time series analysis and represent a significant proportion of all investments, their inclusion in a certain transition risk-related portfolio, e.g. in the lower transition risk portfolio, would have a substantial impact on the findings.

105. An alternative approach could be to perform a separate calculation for financial institutions or to exclude them from the analysis altogether. A reason for the exclusion or to classify them as neutral could be that the exposure to transition risk depends crucially on the composition of the asset portfolio of the individual financial institutions. This "indirect" exposure to transition risk adds another layer of complexity and a generalised approach might not be sufficiently risk sensitive. Moreover, since the asset portfolio of a financial institution is typically changing substantially over time, the analysis would be continuously out of date. Another point is that the transition challenges towards a low carbon economy for the financial sector are quite different from those faced by the real economy, which face more of a structural operational transition, while financials, at least on the asset portfolio side, only have to change the companies/sectors in which they invest.

106. Moreover, economic sectors generally differ in their transition pathway towards a low carbon economy. Therefore, under consideration of sufficient data availability, a granular analysis by means of building asset portfolios for each economic sector, i.e. per NACE-code level, might provide additional insights and a more precise capital allocation from a prudential

[29] The smallest shock is -1%.

perspective. An average overall risk may for example be the result of combining two NACE code sectors with significantly above and below average risk respectively.

107. Asset portfolios could be constructed based on the companies in each of the CPRS defined by Battiston et al. (2017). These are fossil-fuels, utility/electricity, energy-intensive, buildings, transportation, and agriculture. While Battiston et al. (2017) provides no quantification for their transition risk there are clearly differences between these sectors. There may for example be a future without fossil fuels (as suggested by the EU's 2050 long-term strategy - an economy with net-zero greenhouse gas emissions) while there will always be transportation.

108. Asset portfolios could also be constructed based on the sectors/firms associated with a high transition risk exposure from a forward-looking perspective. One advantage would be the possibility to compare the results of the forward-looking and the historical analysis. One might find for instance that sectors with high future transition risk show also historically high risk levels.

109. This more granular analysis allows reconciling the forward- and backward-looking perspective. It can be assumed that a result would appear as most convincing when certain economic activities would have high risk differentials under both perspectives.

Questions to stakeholders

Q17: Do you see other approaches to define portfolios with companies subject to higher, medium and lower transition risk exposure based on their NACE codes? What are the advantages?

Q18: Do you consider it preferable to combine the CPRS classification (Battiston et al. (2017)) with the use of asset shocks (e.g. DNB stress test) to differentiate assets according to their transition risk exposure or should only the latter be used? Why?

Q19: If debt or equity stress test factors are used (e.g. DNB stress test), how should the thresholds to separate lower, medium and higher transition risk exposures be set?

Q20: Do you have any comments how to test the robustness of the sectoral classifications into higher, medium and lower transition risk exposure?

Q21: Would you have any suggestions how to derive a less granular definition of the higher transition risk sectors (e.g. based on 2nd digit NACE codes) based on the CPRS classification (Battiston et al. (2017)) in line with the granularity of the stress test exercises while preserving the risk sensitivity?

Q22: What is your view on the treatment of financial institutions regarding transition risk?

Q23: Would you have any suggestions for other portfolios that should be analysed (perhaps also portfolios with lower transition risk)? Why are these portfolios relevant?

Q24: What is the minimum number of bonds/equities in a portfolio that ensures results are reliable?

2.3.2.2. Company-Specific Approach

110. Based on the company-specific metrics collected for each firm, one might define two or three portfolios with companies subject to higher, lower and medium transition risk. The approach generally differs depending on how many firm-specific variables and which metric are used.

111. If the metric uses an ordinal scale (like credit ratings with categories A, BBB etc.) one could simply distinguish between the different categories defined by the metric or aggregate several categories to larger ones. If a cardinal scale is used (e.g. GHG emissions) thresholds could be defined to construct two (higher/lower transition risk) or three portfolios (higher/medium/lower). One difficulty would be to define the adequate level of thresholds.

112. The case where multiple variables are considered would be slightly more complex. In order to apply a conceptually similar approach compared to the single variable approach, the variables have to be aggregated into a single measure.

113. For example two variables are considered as proxies for transition risk: GHG emissions and change in GHG emissions. A possible approach could be to rank all the firms based on the two variables (descending in case of GHG emissions, ascending in case of change in GHG emissions). Each firm would have two ranks that could be added to derive a measure for transition risk, where firms with the highest values would be the most exposed to transition risk.

114. The implicit assumption would be that both rankings are equally important. This could for instance result in a company with low emission levels which are stable having the same transition risk measure as a company reducing emissions from very high to high emission levels.

115. If there were more than two variables, the procedure would be the same but including also forward-looking measures related to the commitment of the firm to reduce emissions in the future. The approach would be definitely more complex, because such forward-looking variables would need a different weight depending on the economic sector in which the company operates. The existence of an ambitious commitment to reduce emissions would be more relevant for firms operating in high emission sectors, whereas (although important) it would be less relevant for firms that already operate with a relatively low level of GHG emissions. In this case an approach based on equal weightings as in the previous case would not be feasible.

116. Different weights should be assigned depending on the economic sector. For instance, a possible approach could be to assign a higher weight to these forward-looking transition

variables if the firm operates in a high emission sector (e.g. the CPRS) and a lower weight otherwise. This approach would however involve a further element of expert judgment, in addition to that involved in the choice of the thresholds.

117. Instead of starting with the definition of thresholds an alternative approach could be to calculate a risk measure for each company and then to see whether there is a relationship with the transition risk measure. A possible result could be for example that on average companies with a higher transition risk measure had higher historical risk. This would allow an analysis without the need to define thresholds. Depending on the results one could define such thresholds afterwards.

Questions to stakeholders

Q25: Do you see other approaches to define portfolios with companies subject to higher, medium and lower transition risk based on the company-specific approach? What are their advantages?

Q26: How should the thresholds to separate lower, medium and higher transition risk sectors be chosen?

Q27: Do you have any comments on how to test the robustness of the transition risk classifications?

2.3.2.3. Discussion of the Sectoral vs Individual Approach

118. The sectoral approach to classify assets according to their transition risk exposure has the following advantages:

- Insurers already have to provide sectoral asset information (NACE codes) for their direct investments under Solvency II. In contrast, transition risk information for individual companies (especially outside the EU) might not be available or costly to retrieve.
- The sectoral approach would require no (or very limited) subjective judgment regarding the level of transition risk exposure by the insurance undertaking.[30] Supervisors could easily challenge it based on publicly available information.
- The granularity of the capital requirements for market risks related to stocks and bonds in the Standard Formula of Solvency II should not be higher than necessary to achieve an appropriate risk-based allocation of solvency capital. A differentiated regulatory treatment regarding transition risk exposures based on (aggregates of) sectors would allow for a relatively low granularity.

[30] The NACE codes provided by data providers may differ.

119. The sectoral approach to classify assets according to their transition risk exposure has the following disadvantages:

- The underlying assumption is that the economic sector is the main determinant of transition risk. Company specifics that alter the risk relative to the corresponding sector are not considered. As a consequence, the risk of individual companies may be over- or underestimated.
- In particular, there is no recognition of companies within a high transition risk sector making substantial efforts to reduce GHG emissions and thus transition risk. There are consequently no solvency capital-related incentives for more sustainable behaviour.
- There can be ambiguity in assigning a company to a specific economic sector in case it operates multiple different business lines.

120. The company-specific approach to classify assets according to their transition risk exposure has the following advantages:

- Company specifics that alter the transition risk exposure relative to the corresponding sector are taken into account.
- Future actions related to the firm's decarbonisation pathway could be better reflected.
- While the economic sector has an impact on transition risk, it influences the historical equity and debt risk in various other ways (competitive situation, barriers to entry, etc.). A company specific measure of transition risk could in theory allow to "isolate" the effect of transition risk on historical price volatility.

121. The company-specific approach to classify assets according to their transition risk exposure has the following disadvantages:

- The approach has a higher degree of complexity compared with the sectoral approach as (multiple) firm-specific variables need to be considered.
- The approach requires the availability of reliable company specific data on emissions, resource use, etc. or alternatively of environmentally-related ratings.
- The use of sustainability ratings introduces dependence on a rating provider for prudential purposes.

Questions to stakeholders

Q28: Do you have any comments on the advantages and disadvantages regarding both the sectoral and the firm-level classification approach?

Q29: What approach should be preferred? Why?

2.4. CONSTRUCTION OF EQUITY PORTFOLIOS

122. The previous sections have set out different approaches how asset portfolios with companies subject to different levels of transition risk could be defined. This section describes how corresponding equity portfolios could be constructed and their historical risk estimated as basis for an assessment of the potential for a dedicated prudential treatment regarding transition risk.

123. The general process is as follows: First, it has to be decided which companies can qualify for the inclusion in the asset portfolios. A crucial question is how the effect of transition risk potentially materializing in asset prices can be separated from the other risk drivers and to what extent its disentanglement is necessary from a prudential perspective. Before any calculations can be performed decisions regarding data cleaning (e.g. missing days, non-trading days, etc.) are necessary. Further steps are to set rules for determining the value of the portfolios at each point in time (e.g. consideration of dividends, currency, etc.) and to choose an appropriate market risk measure for a prudential risk assessment under Solvency II.

2.4.1. UNIVERSE OF COMPANIES

124. One possible choice as starting point for the construction of the equity portfolios are the constituents of the MSCI World Index. There could be at least two reasons for this: Firstly, the calibration of the equity risk in the Standard Formula is mainly based on the MSCI World Index. Using the same index for a dedicated risk assessment of transition risk would reduce selection bias potentially driving findings. Secondly, the MSCI World Index covers companies from multiple different countries with all kinds of economic activities.[31]

125. Alternatively, the constituents of a European index like the MSCI Europe could be used to construct equity portfolios. One could make an argument that the European Union takes a more decisive approach to mitigate climate change than other jurisdictions. If one follows this argument, transition risks may have materialized to a larger extent in the historical equity prices of European companies. Moreover, insurance undertakings in the EU applying the Standard Formula typically invest mainly in European equities.

[31] Certain sectors like information technology are not well represented in European equity indices.

126. Depending on the chosen equity index, the question is to focus on large cap firms or on medium/small cap companies (SMEs). Both the comparability with the equity risk calibration in the Standard Formula of Solvency II as well as the available investment volumes are arguments in favour of a large cap index. But these are typically well-established companies with a long business history and the chances to find “green” companies with innovative technologies preventing climate change and thus constituting a minimum level of transition risk might be higher for SMEs.

127. Another central question is whether the equity portfolios should be based on the constituents of the chosen index as of today or based on its varying composition over the past. The first option is easier to implement, and the portfolio is closer to the current investment opportunities. The second option follows the methodology for the MSCI Indices and avoids survivorship bias. In case the analysis is restricted to recent periods both approaches should produce similar results.

Questions to stakeholders

Q30: Which equity index should be selected in terms of geography and size of the constituents to assess transition risk exposures? Why?

Q31: What are your views on applying a constant or changing composition of constituents regarding the equity portfolios? How material would the deviation between the two approaches be?

2.4.2. STATIC OR DYNAMIC MEASUREMENT OF TRANSITION RISK

128. The measurement and classification of transition risk exposures for individual companies and consequently the (non-)inclusion of their equities into the equity portfolios for the transition risk assessment could be done on a static or dynamic basis.

129. Static would mean that classification of the transition risk exposure of a firm is based on the information about the company in the present, i.e. its present climate footprint. One advantage is that there is no need to retrieve corresponding information from the past years. This could be a particular challenge if longer historical periods are considered and if company-specific transition risk measures are to be used, which are typically limited in their time-series.

130. For the portfolios with higher, medium and lower transition risk the “error” introduced by the static measurement should be limited provided the relative level of transition risk remains fairly stable over time. Where portfolios of certain sectors are analyzed, no problems should arise unless a meaningful number of companies moved in the past from one sector to another. But also, then the impact might be limited: If for example a company migrated in the past from sector X to sector Y but both are included in the same portfolio then there is no effect. An example would be an oil company which was initially active in exploration (NACE code B6) but

moves more and more into refining (C19). Both sectors are part of the Battiston et al. (2017) CPRS regarding fossil fuels.

131. The dynamic measurement should be in principle more accurate as it takes information about a firm's climate footprint on a regular basis into account. For instance, the classification of a firm's transition risk exposure and thereby its inclusion in the corresponding equity portfolio for risk assessment could be conducted on an annual basis. In this regard, the dynamic approach can capture the potentially changing levels of transition risk exposures at firm-level, requires, however, sufficiently more data that needs to be available for a sufficiently long-time series. Moreover, it raises the complexity for the risk assessment that might not be necessary for the purpose of Solvency II's Standard Formula.

132. Irrespective of the chosen approach there is the general problem that transition risk will have varied over time and possibly differ from its current level. But this is inherent in any historical analysis.

Question to stakeholders

Q32: Do you agree that a static measurement of transition risk is sufficient? If not, can you suggest relevant data sources to implement a dynamic measurement?

2.4.3. ISOLATING THE EFFECT OF TRANSITION RISK

133. The historical fluctuations of equity prices can have many causes. In the best case it would be possible to isolate the effect of transition risk materializing from other factors. One idea could be to perform a regression analysis with a suitable equity risk measure as the dependent variable and risk factors like profitability, leverage, sector and a transition risk measure as the independent variables. One problem could be that the sector and the transition risk measure might be highly correlated.

134. The potential regression analysis should deliver findings showing that x% of the measured equity risk is associated with transition risk while the remaining 100-x% is associated with other causes. Under the assumption that the latter component does not change in future, an estimate of the "transition risk component" to forecast the overall risk can be derived.

135. Another idea would be to conduct an event study design and to select periods where the effect of transition risk could have been particularly strong (e.g. immediately after the signing of the 2015 Paris Climate Agreement and the 2016 U.S. presidency election). A challenge is that under Solvency II market risk is measured based on a 12-month period, raising the question how to interpret the event study results from an annual perspective.

136. In view of the conceptual and technical difficulties to isolate the effects of transition risks on asset prices, an alternative could be simply to calculate the historical equity risk for the portfolios without any adjustment (i.e. without the attempt to separate the transition risk). After all, the regulatory risk charges have to cover all risks and not only transition risk.

137. For example, if companies show a historical equity risk above the market average, the conclusion might be that the future risk will also be above average, particular under the assumptions that

- the transition risks going forward will be not lower than in the past (and this seems to be a reasonable assumption given that the political will to act has increased over time and alternative technologies have been developed);
- the other risks will not be substantially lower than in the past

138. This would be even true if the effect of transition risk materializing in the past was low or even zero. If on the other hand the historical risk for a sector was considerably below the market average (e.g. because the sector is a "defensive" one), then even an increased transition risk going forward would not necessarily translate into above average risk.

139. The difficulties of disentangling the effects of transition risk materializing from other factors highlight the benefits of combining the backward- and the forward-looking analysis when drawing conclusions. If the results for both coincide this allows to make statements about risk differences in the future with a higher level of confidence.

Questions to stakeholders

Q33: Do you consider it necessary to isolate the effect of transition risk materializing in the observed historical equity risk of firms from other risk drivers from a prudential perspective?

Q34: Do you have any suggestions how to isolate the pure transition risk effect on equity risk?

2.4.4. TREATMENT OF MISSING DATA

140. Once the relevant companies and periods have been selected, the data (e.g. prices and number of shares) can be retrieved. There are different approaches to deal with data gaps that should strike a balance between the quality of the data and not discarding too much information.

141. There are in principle three kinds of adjustments regarding missing data: Firstly, individual companies are excluded from the portfolio in case too much data is missing. Secondly, the portfolio values are not calculated for some days even though at least some company data is available (e.g. non-trading days in certain jurisdictions). Thirdly, missing data is added (e.g. based on data from the previous and following day).

142. A possible approach to missing data could be:

- All companies are removed for which data is missing for the first day of the period.
- Certain public holidays are removed (e.g. 24 December)

- Days when less than 75% of the principally available prices are missing are removed.[32] This eliminates many public holidays.
- Gaps of a length of up to 6 days for the number of shares and up to 2 for the price are filled with the most recent value before the gap provided it deviates by not more than 0.5 %from the value directly after the gap.
- Days are removed if the available number of shares or prices is 5% lower than the principally available numbers.

143. The removal of days has no significant effect on the measured risk provided they fall into non-crisis periods. If crisis period data is removed this is no problem as long as the number of days is sufficiently small.

Questions to stakeholders

Q35: Do you have comments on the approach for treating missing data?

Q36: Are there specific issues with missing data for non-listed equities? How should they be solved?

2.4.5. CALCULATION OF EQUITY PORTFOLIO VALUES

144. This section sets out the approach in case calculations are performed based on unadjusted prices (e.g. in case there is no separation of the effects of transition risk materializing and other risks). Possible approaches in case of a different choice are covered in the questions.

145. It seems reasonable to use the MSCI Index methodology as a starting point as the original equity calibration under Solvency II was derived from MSCI indices. In this case the portfolio value at the first day of the calculation is set to an arbitrary value (e.g. one). The day-to-day change is then calculated based on the changes in share prices and exchange rates.

146. Several decisions are necessary in several areas.

147. Reflection of corporate events: In the calculation of indices adjustments are performed to reflect the effect of certain corporate events. This can be for example a stock split. Performing such adjustments for the portfolios would require considerable effort. At the same time the impact on a sufficiently large portfolio of stocks should be limited. This might be an argument for a simplified approach in which such events are not considered.

148. Dividends: There are two arguments against considering dividends. Firstly, the original equity risk calibration under Solvency II was based on price indices. Secondly, the impact of excluding dividends over a 12-month period is much more limited than over longer periods. An

[32] Prices are principally available for a certain stock at a certain day if they are available for a previous day.

argument for considering them is that the comparison of returns for portfolios with significant differences in their dividend yield would otherwise be misleading.

149. Outstanding shares vs. free float: Possible arguments for the use of the free-float is that it is also used in the MSCI methodology and that the resulting portfolios are closer to the actual investment opportunities for Solvency II Standard Formula users.

150. Reference currency: One possibility is to use the U.S. Dollar ("USD") as the reference currency (i.e. all stock prices in other currencies are translated into USD using the exchange rate for the day). One argument for this approach is that the original equity calibration was based on the MSCI World Index calculated in USD. An alternative is to use the EURO as reference currency.

151. The choice between outstanding shares and free float seems irrelevant for non-listed equities. Otherwise, the same considerations should apply.

Questions to stakeholders

Q37: Do you have comments on the proposals regarding calculating the equity portfolio's value?

Q38: Are there specific considerations that apply for non-listed equities?

2.4.6. SELECTION OF TIME PERIOD AND EQUITY RISK MEASURES

152. One crucial question is the selection of the historical period of time for which equity risk and the impact of transition risk is measured.

153. The period from 2015 until 2021 seems particularly important for the analysis of transition risks due to their presumably stronger materialization in asset prices following the 2015 Paris climate agreement. This time period does however not include a tail event with a similar breadth and depth in terms of financial market turmoil as the global financial crisis from 2007-09. On this basis the analysis could consider two relevant periods:

- The period between 2007 and 2014, which includes major events in the financial markets like the global financial crisis (GFC) and the EU sovereign debt crisis.
- The period from 2015 to 2021, which covers the time from shortly before the Paris Climate Agreement until recent periods including the COVID-19 crisis.

154. In case unadjusted prices are used the measurement of risk for the chosen periods is quite straightforward: For each day the market value of the portfolio is calculated, and on this basis 12-month historical portfolio returns.

155. The Solvency II framework determines the Solvency Capital Requirement as the 99.5% 12-month Value-at-Risk (VaR) of Basic Own Funds. Following the approach taken by CEIOPS and EIOPA in their advice on Standard Formula market risk calibrations, the 99.5%-VaR of the overlapping 12-month return distribution is calculated.

156. In case of non-listed equity, price data is less frequently available. But also, here it would be possible to calculate portfolio values and on this basis 12-month returns. One question would be whether there is the need to adjust the time series of prices for the possible effects of "smoothing" in the valuation. In case only cash flows or internal rates of return were available it would be very challenging to measure the risk in a way commensurate with the Solvency II risk measurement.

Questions to stakeholders

Q39: Do you have comments on the selection of periods for assessing equity risk?

Q40: Do you have comments on the measurement of equity risk if no adjustment for transition risk is performed?

2.4.7. POSSIBLE INTERPRETATION OF RESULTS

157. In case unadjusted prices are used the analysis of the results for the historical risk one could follow a "relative approach", i.e. the historical Value-at-Risk estimates for the different portfolios are compared, or an "absolute approach", i.e. the absolute levels are considered.

158. The arguments for the former would be: Firstly, there could be several simplifications in the calculation of risk figures for the self-defined portfolios (e.g. no rebalancing). While this poses not necessarily a problem when comparing the figures for different portfolios, the results may deviate to some extent from the historical 99.5%-Value at Risk. Secondly, there would be the possibility to reflect the period from 2015 to 2021 which seem relevant in terms of the transition risk. Due to the absence of an event comparable to the magnitude of the global financial crisis (2007-09) in its impact on financial markets, the observed risk for the chosen portfolios during this period will be in many cases considerably below the risk for the longer period 2007 to 2021 and below the regulatory capital requirement.

159. The main argument for the absolute approach is that capital requirements have to cover the absolute and not the relative risk.

Question to stakeholders

Q41: What is your view on the merits of the absolute vs. relative approach? Why?

2.5. CONSTRUCTION OF DEBT PORTFOLIOS

160. In order to construct debt portfolios to study the link between spread risk and transition risk, large parts of the considerations regarding the construction of equity portfolios can be transferred (esp. the classification and measurement of transition risk exposures of firms).

These aspects are therefore not covered again in this section, but challenges regarding the debt analysis are explicitly discussed.

2.5.1. UNIVERSE OF COMPANIES

161. The obvious starting point seems to be the bonds included in a commonly used bond index. The spread risk calibration that CEIOPS suggested was based on a European bond index. It is suggested to follow this approach for the analysis of transition risk as well, and extend it using U.S. Bond indices if necessary due to data limitations in the European context.

162. A possible index choice could be the corporate bonds included in the "iBoxx € Overall" and "iBoxx $ Overall" indices. The use of bond indices excludes necessarily less liquid bonds, introducing a potential selection bias towards large companies similarly to the situation for equity portfolios.

163. There seems to be no reason to restrict the analysis to certain maturities. In terms of credit ratings, the focus should be on investment grade bonds.

164. As bonds have in contrast to equities a fixed maturity the use of the index constituents as of today is not really an option for constructing historical portfolios (i.e. portfolios with varying compositions have to be used).

165. EIOPA is currently not aware of a bond index for non-traded debt. The same considerations as for traded bonds in terms of the geographical focus apply here as well. The debt will in most cases not be rated by a rating agency. In terms of the size, the companies issuing non-traded debt tend to be smaller ones.

Questions to stakeholders

Q42: Which bond indices could be a suitable source for traded bonds? Why? Are there other relevant sources for traded debt?

Q43: Do you have any comments on the considerations regarding maturities and credit ratings for the analysis of transition risk?

Q44: What could be suitable sources for data on non-traded debt?

2.5.2. CALCULATION OF DEBT PORTFOLIO VALUES

166. Following the Solvency II framework, historical risk should be measured based on spread volatility. In principle, the most suitable rate for calculating spreads would be the EIOPA Risk-Free-Rate (provided it is available for a given date). At least for the analysis of possible transition risk-related differences of bonds it seems though sufficient to use the spreads that the index providers produce. The relative risk of two portfolios should not vary too much depending on the reference rate.

167. Based on the spreads for individual bonds, the portfolio spread can be estimated as a simple or market value weighted average. An argument for the latter would be that it is closer to the actual spread for portfolios of bonds that insurers hold. A simple average has the advantage that it can provide a more robust estimate for the spreads. This approach was also followed in the initial calibration for spread risk under Solvency II developed by CEIOPS. In many cases the difference between the two values may in any case be small.

168. In the calculation of market weighted spreads for listed bonds, the market price of all bonds would be calculated as the product of the market price for the individual bond and the number of bonds issued.

169. For traded bonds the spreads can be calculated for each trading day. For non-traded debt the frequency is lower.

Questions to stakeholders

Q45: Do you have comments on the use of spread data provided by index providers for the analysis?

Q46: Do you think that a simple or a market value weighted spread should be used? Why?

2.5.3. SELECTION OF TIME PERIOD AND DEBT RISK MEASURES

170. The same considerations regarding the relevant time periods as for equities apply.

171. The Solvency II framework determines the Solvency Capital Requirement as the 99.5% 12-month Value-at-Risk (VaR) of Basic Own Funds. Following the approach taken by CEIOPS and EIOPA in their advice on Standard Formula market risk calibrations, one could calculate the 99.5% VaR of the overlapping 12-month spread change distribution.

172. Instead of building a spread index for each day of the considered 12-month period across all bonds one could also work with approximations to reduce computational efforts substantially. As prudential risk calibrations are driven by tail events, a possible approach could be to identify in a first step the 12-month time periods in which broad corporate spread indices displayed the largest increase in spreads. In a second step the 12-month daily spread changes for the selected periods are calculated. While deriving conclusions about the absolute level of spread and transition risk on this approach would be less informative, the results however can be used to compare the risk for portfolios in a relative perspective to derive conclusions on the potential for transition risk related spread risk differentials.

173. The results should be calculated for all the rating classes for which enough bonds are available for the chosen portfolio. The spread changes depend also on the remaining maturity/duration of the bonds. The portfolios defined based on transition risk may be different in this respect. This could be accounted for in different ways: The first step would be to see whether the differences are actually significant. If so, one possibility would be to define several

maturity buckets. This has the drawback of reducing the number of available observations for narrowly defined portfolios. An alternative could be to estimate the impact of the modified duration on the spread change based on a linear regression and then to adjust the spread changes so that they are uncorrelated with the modified duration.

174. For non-traded debt, price data is less frequently available. Otherwise, the same considerations seem relevant as well.

Questions to stakeholders

Q47: Do you have comments on the selection of relevant time periods for the analysis?

Q48: Do you have any suggestions how the similarity of different portfolios in terms of modified duration could be measured?

Q49: What are the possibilities to account for the effect of duration/remaining maturity other than defining maturity/duration buckets? How would this work?

Q50: How could risk be measured for non-traded debt?

2.6. PROPERTY RISK AND TRANSITION RISK

175. Real estate markets play an important role for the transition towards a low-carbon economy and society. The construction and energy use of buildings is associated with a noticeable share of greenhouse gas emissions – rendering the upgrading of the energy efficiency of existing buildings or strict requirements on new buildings a key dimension of climate transition policies in the EU.[33] In that regard, differences in the energy efficiency of buildings might be associated with different levels of transition risk exposures, potentially materialising in a building's market value through changes in the market demand towards a preference for energy efficient buildings or political changes regarding energy-related building codes. As insurers in the EU allocate about 8% of their investments to the real estate sector, potential changes in the property value related to energy efficiency, if existing, could also materially affect the balance sheets of insurers from a prudential perspective.[34]

176. As real estate valuation is typically based on private transactions, corresponding data is often not publicly available. Therefore, a different approach for the intended analysis needs to be taken. The following sections focus on the rationale underlying the potential influence of

[33] EU Commissioner for Energy, Kadri Simson, declared: "Buildings are the single largest energy consumer in Europe, using 40% of our energy, and creating 36% of our greenhouse gas emissions. That is because most buildings in the EU are not energy efficient and are still mostly powered by fossil fuels. We need to do something about this urgently, as over 85% of today's buildings will still be standing in 2050, when Europe must be climate neutral", see EC (2021a).

[34] EIOPA (2020a), ECB (2019).

transition risk in terms of a building's energy efficiency on property risk and describe potential approaches for a corresponding analysis regarding Solvency II's prudential treatment of property risk.

2.6.1. BUILDINGS AND ENERGY EFFICIENCY

177. The European Commission estimates that the use and operation of buildings represent 40% of total energy consumption and 36% of energy-related greenhouse gas emissions in the EU, making the decarbonization of the buildings sector a key aspect of the EU's objectives set out in the Green Deal. Improving the energy efficiency of buildings in the EU can reduce the total energy consumption by 5-6% and reduce carbon dioxide emissions by about 5%. However, around 75% of the EU's building stock can be considered energy inefficient according to current building standards, and, on average, annual renovation rates of the building stock correspond to only less than 1%.[35]

Definition of Energy Efficiency

The energy performance of a building can be defined as the "amount of energy needed to meet the energy demand associated with a typical use of the building, which includes, inter alia, energy used for heating, cooling, ventilation, hot water and lighting" (Art. 2 of Directive 2010/31/EU on the Energy Performance of Buildings). In this view, energy efficiency refers to buildings for which needs are covered using a comparatively lower amount of energy. Energy efficiency encompasses both the performance of the outdoor building envelope, including insulation, and the performance of the indoor elements and technical systems, related notably to heating and cooling, lighting and ventilation.

The proposed revision in December 2021 of the Directive introduces minimum energy performance standards, with the aim to achieve a zero-emission and fully decarbonized building stock by 2050. In this perspective, the Directive gives more weight to the Energy Performance Certificates (EPCs), with the objective to refine their definition and widen their use. A-rated buildings will correspond to zero-emission buildings, whilst the G-rated buildings will represent the 15% worst performing buildings; the remaining buildings will be attributed a certificate between A and G.

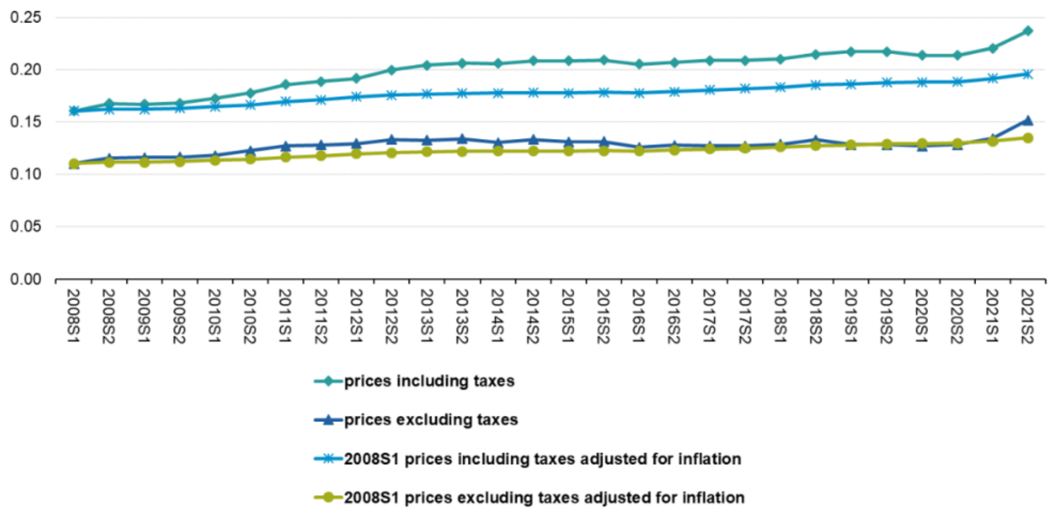
178. In 2020, 70% of the EU's population lives in a home they own, whilst the remaining 30% lives in rented housing.[36] On average, 20.1% of a household's disposable income is dedicated to

[35] EC (2021b).

[36] Eurostat (2021).

housing costs in the EU.[37] As energy prices increased materially over the last decade across EU countries, energy cost-related pressure on a household's income increased as well. For example, regarding electricity, the EU average price increased from €0.16 per kWh in 2008 to €0.24 per kWh in 2021 (Figure 1). Adjusted for inflation, prices increased from €0.16 per kWh in 2008 to €0.20 per kWh in 2021.[38]

Figure 1: Development of electricity prices for household consumers, EU, 2008-2021 (EUR per kWh)



Source: Eurostat (2022).

2.6.2. MARKET DEMAND AND ENERGY EFFICIENCY

179. Changes in the market demand towards a preference for energy efficient buildings, for example triggered by realized or expected increases in energy prices, could potentially materialize as transition risk to the market values of buildings.

180. Improvements in a building's level of energy efficiency directly influence the income of homeowners or tenants. Higher levels of energy efficiency result in lower levels of energy consumption and lower energy expenses. These energy savings compared to a less energy efficient building can accumulate to a positive net present value of the necessary investments for energy efficiency measures, which could materialize in a higher relative market value of an energy efficient building in a house transaction. For example, Zancanella et al. (2018) show that improvements in energy efficiency are associated with an increase of 3-8% in the market values of residential buildings relative to similar buildings with a worse energy performance, and an increase of 3-5% in residential rents. The International Energy Agency (IEA) estimates that

[37] Eurostat (2021).

[38] Eurostat (2022).

households in the United Kingdom saved, on average, USD 300 per capita due to cumulative energy efficiency improvements since 2000, reflecting around 20% of their yearly energy expenditures. German households saved, on average, around USD 370 per capita, mainly from reducing the use of gas.[39] Energy price shocks strengthen the role of energy savings for the market valuation of buildings even more and can be expected to materially increase the market demand for energy efficient buildings compared to less efficient buildings, and thereby contribute to a potential energy-related price differential.

181. Improvements in the energy efficiency of a building can also protect the homeowner or tenant from adverse changes in the volatility of energy prices, in particular in case of energy price shocks. Energy efficiency can constitute an income protection through smoothing the homeowner's or tenant's energy expenses, and thereby reduce the potential for energy price shocks to depress the market value of buildings due to raising energy costs. Furthermore, in case of general economic shocks depressing real estate valuations, energy efficient buildings might expect a relatively lower drop in their valuations compared to less energy efficient buildings, as efficient buildings might be associated with a stronger economic recovering potential due to lower energy expenses (e.g. attracting new business quicker in case of commercial buildings, etc.).

2.6.3. HOUSING REGULATION AND THE RISK OF "STRANDED PROPERTIES"

182. The regulatory environment regarding the energy performance of commercial and residential buildings is changing rapidly across Europe, both at EU and national level. Regulatory changes imposing stricter energy efficiency requirements on buildings could also materialize as transition risk to the values of buildings, particularly for buildings not meeting the specified criteria.

183. The EU Energy Performance of Buildings Directive (EPBD) requires that buildings or building units which are constructed, sold or rented out to new tenants provide energy performance certificates (EPC). According to the EPBD, an EPC shall include information on the energy performance of a building and the reference values. It shall also include recommendations on the cost-optimal, or cost-effective, improvements of the energy performance of a building or dwelling.

184. In December 2021, the Commission published a proposal for a revision of the EPBD in order to achieve a decarbonized building stock by 2050.[40] The proposal aims to enhance the consistency of the EPCs by including a template with a minimum number of common indicators on energy and GHG emissions, complemented with several voluntary ones. The A rating should correspond to zero-emission buildings while the G rating corresponds to the 15% worst

[39] IEA (2022).

[40] EC (2022a).

performing buildings in each country, with the remaining buildings in the country distributed proportionately among the classes in between. Under the Commission's proposal:

- public and non-residential buildings will have to be renovated and improved to at least energy performance level F at the latest by 2027, and to at least level E by 2030 at the latest;
- residential buildings should be renovated from G to at least F by 2030, and to at least E by 2033.

185. As from 1 January 2030, new buildings should be zero-emission buildings, whereas new public buildings should be zero-emission buildings as of 2027. The Commission's proposal would also require Member States to set up a public database, ensuring public access to data related to energy performance certificates, inspections, the building renovation passport, the smart readiness indicator and the calculated or metered energy consumption of the buildings.[41]

186. At national level, further political examples regarding the energy efficiency of buildings include:

- In France, the worst energy-performance housing will be progressively banned from renting as of 2023. The maximum final energy consumption threshold for a residential building will be set at 450 kWh/m² as of 1 January 2023 for metropolitan France (buildings classified as F will be banned from renting as of 2028, and buildings classified as E from 2034). The buildings concerned will no longer be able to be rented afterwards.[42] From 2023 onwards, owners of the worst energy-performance housing will also be obliged to carry out energy renovation work if they wish to increase the rent of their accommodation.
- In Germany, a carbon price on heating in the building sector has been implemented in 2021. The tax for CO2 emissions will be split between property owners and tenants.[43] The measure aims at encouraging energy-efficient renovations.
- In the Netherlands, an amendment introduced in 2018 to the Dutch Building Decree 2012 imposes that office buildings will have to obtain an energy performance certificate of at least level C by 2023, and aims to increase to level A by 2030. Another amendment in 2021 to the same Decree requires that residential buildings are (almost) energy neutral. The near energy neutrality of buildings follows three rules: (1) the outer layer of the building must reduce the energy demand, (2) the remaining required energy must be generated as efficiently as possible, and (3) the energy demand from the use

[41] EC (2021c).

[42] French Government (2021).

[43] Federal Government of Germany (2020).

of the building must be met by energy generated as much as possible from renewable sources.[44]

- In Belgium, the Brussels-Capital Region adopted a renovation strategy in 2019, whereby all buildings will be obliged to have an energy performance certificate by 2025, and with the aim to achieve an average energy performance level of 100 kWh/m²/year for all housing in 2050 (i.e. an average consumption of one third of the current situation).[45] In order to achieve these objectives by 2050, renovation obligations will be implemented through a legislative process that should be finalized in 2024.
- In Ireland, the government is increasing grants already available for home improvements, as part of its Climate Action Plan.[46] The Plan contains requirements and financial actions (e.g. grants) to help homeowners to decarbonize their buildings and to raise the number of homes, businesses and rental properties with energy performance certificates.[47]

Questions to stakeholders

Q51: If there is a link between a building's energy efficiency and its market value, what are the economic drivers for this link?

Q52: Do you have quantitative evidence on the potential link between a building's energy efficiency and its market value on EU housing markets?

Q53: Are Energy Performance Certificates an appropriate measure for transition risk on residential and commercial real estate markets?

2.6.4. LITERATURE REVIEW

187. The link between a building's level of energy efficiency and the building's market value has been studied frequently in the recent literature. On the one hand, substantial differences in the data and methodologies for the analyses appear, suggesting a general lack of harmonization regarding the disclosure and reporting of data related to energy efficiency and house prices, and also a lack of consensus about the underlying economic channels that might cause an energy efficiency-related risk differential. On the other hand, the empirical findings derived in different countries suggest the existence of a (robust) material price differential in the housing

[44] DNB (2022); Netherlands Enterprise Agency (2022); Euractiv (2020); Sunderland and Santini (2020).

[45] Bruxelles Environnement (2019).

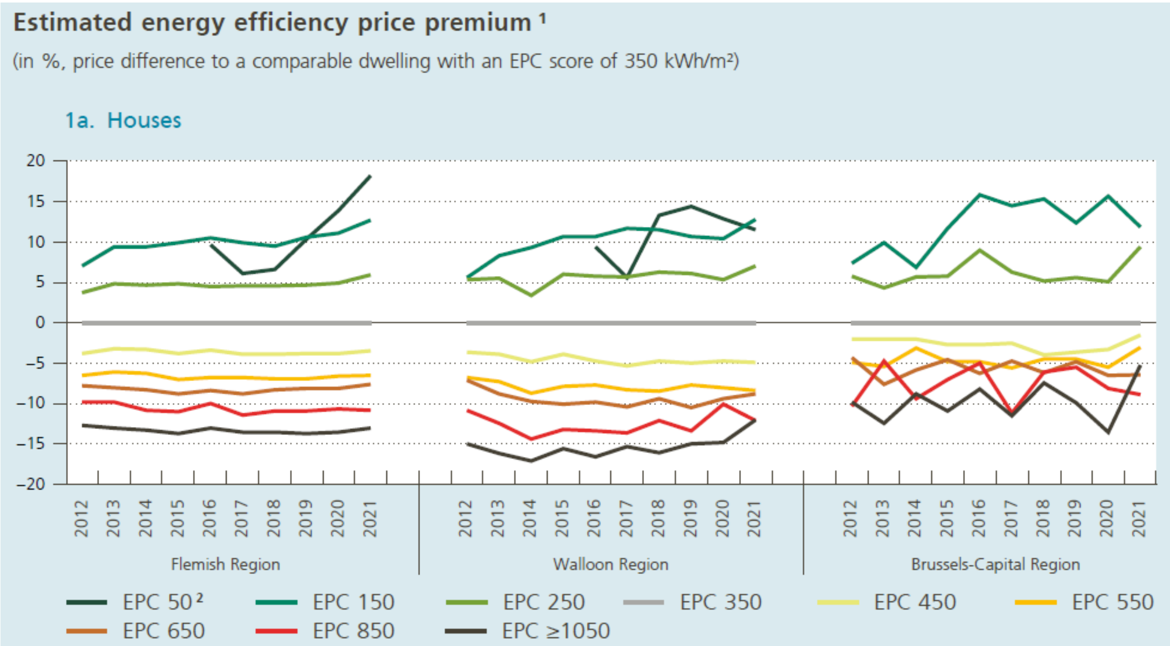
[46] Department of the Environment, Climate and Communications (2020).

[47] Department of Communications, Climate Action and Environment (2019).

market related to a building's level of energy efficiency, which might hold at a general European level.

188. Reusens et al. (2022) estimate the impact of energy efficiency on house prices in Belgium by combining the transaction dataset from the Federal Public Service Finance and the regional energy agencies' EPC datasets between 2011 and 2021. Based on hedonic price indices, the analysis measures the price changes of an identical house over time potentially related to the building's energy performance. The analysis concludes that the level of a building's energy efficiency influences its sales price. In particular, a house with a high level of energy efficiency (EPC score of 150 kWh/m²) shows a price premium of about 12% compared to a similar reference house with a substantially lower level of energy efficiency (EPC score of 350 kWh/m²) in 2021. Figure 2 provides a complete overview of the time series of the energy efficiency related price premiums found in the analysis by Reusens et al. (2022). Compared to the reference house (EPC score of 350 kWh/m²), price differentials amount to +17 % (EPC 50), +12 % (EPC 150), +6 % (EPC 250), –4 % (EPC 450), –7 % (EPC 550), –8 % (EPC 650), –9 % (EPC 750), -11 % (EPC 850), –11 % (EPC 950) and –13 % (EPC above 1050) in 2021.

Figure 2: Price Premia related to energy efficiency in Belgium



Source: Reusens et al. (2022).

189. The empirical findings by Reusens et al. (2022) are in line with the corresponding literature. For instance, Copiello and Donati (2021) provide a broad overview of corresponding empirical studies. Across different housing markets, relative price premiums between more and less energy efficient houses are found in the range of 1-10%, accompanied by several severe outliers

in the range of 25% and 84%. Although there is no full coverage of EEA countries, the overview suggests that energy performance-related price differentials might conceptually hold at the entire European level.

190. Moreover, work by the Energy Efficiency Data Protocol and Portal (EeDaPP) concludes that investments in energy efficiency can lead to an increased valuation of real estate, owing notably to a lower energy consumption.[48] The report provides evidence that highly energy efficient properties are associated with lower mortgage default risk compared to low energy efficient properties due to (1) the higher value of the property, (2) the lower energy consumption costs, and (3) lower energy transition risk. However, the analysis of a causal relationship between energy efficiency and probability of mortgage default is left for future research.

191. Zancanella et al. (2018) show that higher energy performance is becoming the norm, highlighting an increasing transition risk: due to increasing stringency of regulatory requirements, poorly energy efficient buildings fall below standards and become less attractive due to increasing level of necessary economic input for upgrading (“brown discount”). On the other hand, properties that achieve or overpass the sustainability requirements or other green features can experience a “green premium”, which is a higher property value assigned by potential buyers or tenants related to lower operational costs or better living conditions. As a rule of thumb, an increase of 3-8% in the price of residential assets as a result of energy efficiency improvements, and an increase of around 3-5% in residential rents compared to similar properties can be observed.

192. Guin et al. (2022) examine the credit-riskiness of mortgages depending on the energy efficiency of the underlying buildings. The paper’s descriptive analyses suggest that about 0.93% of residential mortgages against energy-efficient properties are in payment arrears. This share is 0.21 percentage points lower than the share of mortgages against energy-inefficient properties. The authors conclude that the energy efficiency of a property is a relevant predictor of mortgage payment arrears, although future research needs to be carried out before implying a formal causal relationship between higher energy efficiency and lower mortgage payment arrears.

193. Van Tendeloo (2020) identifies real estate as a main contributor to greenhouse gas emissions in Belgium. The paper highlights that policy measures directed at reducing GHG emissions will target real estate. In this regard, energy inefficiency of real estate exposures is identified as an important risk factor for the transition risk to which the Belgian financial sector is potentially exposed. Besides transition risk, real estate exposures are also subject to physical risk. The credit risk of exposures within sectors or geographies vulnerable to physical risk may be impacted, for example, through lower collateral valuations in real estate portfolios as a result of increased flood risk. Abrupt repricing of real estate due to higher flood risk may cause large

[48] EeDaPP (2020).

negative wealth effects in some exposed regions that may in return weigh on demand and prices through second-round effects.

194. Heijmans and Loncour (2019) highlight, based on a literature review and a factsheet that explores via various studies the EPC rating's impact on property values, a correlation between the EPC and the property price, except in specific market conditions. In general, the impact is the largest for poorly performing buildings. As the main challenge for analysis the lack of access to sufficient granular data is mentioned.

2.6.5. RISK ASSESSMENT

195. Findings on the average value of buildings related to different energy efficiency levels are, however, not fully informative about the underlying risk exposure for investors from a prudential perspective. In particular, differences in the average value of a building do not provide evidence about the scope of variation in the valuations of the buildings. It might be the case that an energy performance-related differential in the market valuation of buildings in normal times changes in times of economic stress when liquidity needs of homeowners or tenants are high. However, evidence on the potential variation of house prices around their average value is largely missing in the literature. Therefore, EIOPA intends to conduct a corresponding quantitative analysis.

196. For the risk assessment under Solvency II, the 0.5% worst annual loss in the market value of a portfolio of buildings is the relevant measure for the corresponding capital requirement on property risk. This was done for the Standard Formula calibration by determining the empirical 99.5% Value-at-Risk based on de-smoothed IPD UK property indices. A potential approach for a risk-based analysis of transition risk can be to construct property price indices based on samples of buildings with the same energy performance level, while controlling for major property characteristics typically driving the market value of a building.

197. The two main variables of interest for the analysis are a building's energy performance and its market value. The energy performance can be measured by a categorical energy performance certificate comprising different levels of energy efficiency, typically ranging from A (most efficient) to H (least efficient) in the EU. For each of these energy performance certificates, a price index needs to be constructed.

198. The building's market value can be measured as the transaction price per square meter of living area for residential buildings, or floor space for commercial buildings. Scaling the building's value by its size makes the valuation more comparable and controls for the potential effect of a building's size on its market value. The market price in a given year is suggested to be deflated by means of a Consumer Price Index to control for general price volatility in the market valuations.

199. Further property characteristics might also drive the market value of a building: these are for instance age, geolocation (e.g. on zip code or street level), size, existence of a garden or a garage, or the building type (e.g. single family house, semi-detached house, etc.).

200. The energy performance-related price indices then track the average price development of a reference building with the specified characteristics over time. Typically, these price indices are constructed based on simple price averages or hedonic regression analyses.[49]

201. From a prudential perspective on property risk, a comparison of the Value-at-Risk of the one-year index returns at the 99.5% confidence level can then provide evidence on a potential energy performance related risk differential for property risk.

Questions to stakeholders

Q54: Do you expect different findings regarding potential risk differentials for commercial and residential buildings? Why?

Q55: What are typical characteristics of commercial and residential buildings influencing their market values and therefore should be controlled for when constructing price indices?

Q56: What are the benefits or disadvantages constructing a price index on hedonic regression analysis or simple price averages for the purpose of studying potential risk differentials?

2.6.6. DATA

202. The public availability of sufficiently granular housing data is very limited across the EEA. Moreover, the disclosure and reporting requirements of Solvency II do not foresee undertakings to report the energy performance of their invested properties. A potential data set for EIOPA's analysis could be the "RWI-GEO-RED" data file provided by the RWI - Leibniz Institute for Economic Research and ImmobilienScout24. The data covers the German housing market based on advertisements for residential buildings on Germany's largest internet platform for properties, ImmobilienScout24, and includes various building characteristics collected on the platform, such as price, size and energy performance certificates.[50] Although the data does not contain the final transaction price of a building, property advertisement data is generally informative about the potential influence of energy efficiency on a building's value as shown in

[49] Reusens et al. (2022) discuss and compare findings on the Belgian housing market based on different methodologies, including simple price averages and hedonic regression analysis.

[50] RWI-GEO-RED: RWI Real Estate Data (Scientific Use File) – houses for sale. Version: 6.1. RWI – Leibniz Institute for Economic Research. Dataset. http://doi.org/10.7807/immo:red:hk:suf:v6.1.

the literature, e.g. on the Irish housing market by Carroll et al. (2020), or on the German housing market by Taruttis and Weber (2022).

Questions to stakeholders

Q57: What are potential data sources for the purpose of the study, i.e. data containing the market value of a building, a measure of its level of energy performance and further value driving characteristics?

Q58: What are the benefits or disadvantages using advertisement data for the purpose of this study?

Q59: Besides transition risk, climate-related physical risk exposures might also influence property risk. Do you have evidence in this regard and what data sources are available to study this potential link?

2.7. FORWARD-LOOKING ASSESSMENT

203. Although the calibration of Solvency II's capital requirements for market risk typically relies on historical data, a purely historical perspective might not be sufficiently informative about climate-related risks. In this regard, historical asset prices materialized under a different paradigm, as climate attributes were not nearly as relevant for asset prices as they will be according to the current trajectories of climate change.

204. In particular, a backward-looking analysis regarding the influence of climate-related risks on asset prices is typically subject to the following challenges:

- Lack of ESG-related definitions, data (e.g. quality, transparency, comparability) and reporting.[51] However, substantial progress has been made, for instance regarding the recent introduction of the EU Taxonomy or the Corporate Sustainability Reporting Directive (CSRD)/ Non-Financial Reporting Directive (NFRD), which will raise substantially the availability of granular ESG-related data in the long-term.
- Absent or subdued policy action to foster the economy's decarbonisation until recent years (e.g. by means of carbon pricing), which limits the available time-series of asset prices internalising the climate-related costs of economic activities.
- Historical paradigm of the world's energy needs being fulfilled using fossil fuels as primary energy source, despite corresponding environmental externalities, made the carbon-footprint of firms a negligible aspect for investors over decades.

[51] See NGFS (2022a), providing an extensive overview and discussion about current challenges regarding ESG-related data.

205. The negative consequences of the global temperature rise are already experienced today, and physical risks are expected to increase further in the next two decades, irrespective of any action taken to reduce carbon emissions. The coming decade will be decisive in whether society will manage to contain global warming thereafter. The latest low and very low emission scenarios considered by the IPCC Working Group 1 require a transition to net zero carbon emissions by 2035 and 2030 respectively to keep temperatures below 2 °C respectively 1.5 °C.[52]

206. Therefore, to properly assess the influence of climate-related risks on asset prices, forward-looking approaches are essential, as they allow to factor in the future materialisation of climate-linked attributes in today's asset prices.[53] Considering the forward-looking nature of environmental risk, the EBA highlights the importance of analysing (future) environmental risks using forward-looking methodologies.[54] Moreover, based on survey results, the NGFS concludes that both financial institutions and credit rating agencies are moving away from classification-based, backward-looking analysis of risk differentials to a more granular, forward-looking assessment of counterparties' vulnerability to climate-related risks.[55]

207. In this regard, EIOPA aims to include a forward-looking approach into the analysis to assess the potential for a dedicated prudential treatment of assets associated with transition risk. A forward-looking analysis provides further insights on the dynamic materialization of transition risk in asset prices and can be used to cross-check and validate the findings from historical time series analysis, since assets with a material transition risk exposure in the past should also show a similar risk exposure at least in the short to mid-term perspective. From a prudential perspective, the calibration of solvency capital risk charges in light of climate change should be based on historical time series analysis, and enriched by findings from a forward-looking perspective to reach a more comprehensive picture on the potential impact of climate change on the solvency capital of insurance undertakings. Due to the complexity of modelling future climate trajectories, a forward-looking analysis for prudential purposes however needs to strike a balance between complexity and accuracy. The following sections describe EIOPA's current approach in this regard.

2.7.1. EXISTING FORWARD-LOOKING ASSESSMENTS

208. Several supervisory authorities – both at national and European level – have already performed forward-looking analyses to assess the exposure of the assets of financial institutions to transition risks. EIOPA studied several analyses of climate transition scenarios developed by

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[52] See IPCC (2021).

[53] Berenguer et al. (2020): "Deep uncertainty makes the use [of] past data (which are lacking anyway) irrelevant to build probabilities. Instead, estimating climate-related risks requires models with a forward-looking approach."

[54] EBA (2022).

[55] NGFS (2022b).

ACPR, DNB, ECB/ESRB as well as EIOPA to build a conceptual framework for the forward-looking analysis of transition risk differentials presented in this chapter.

- ACPR developed and published three transition scenarios for a bottom-up pilot exercise with voluntary participation by banks and insurance undertakings;[56]
- DNB conducted a top-down energy transition stress test of the financial system in the Netherlands, analysing the impact of several severe, but plausible, shock scenarios;[57]
- ECB/ESRB assessed the impact of transition risk (and - for banks only - physical risks) on EU banks, insurance companies and investment funds using a top-down approach.[58] The exercise leverages the results from other climate risk assessments, such as EIOPA's sensitivity analysis of climate-change related transition risks. The assessment for the banking sector makes use of the ECB's economy-wide climate stress test of banks in the euro area.[59] The methodologies used in the latter were also used by ESRB/ECB to develop the transition scenario for EIOPA's occupational pensions stress test in 2022;[60]
- EIOPA analysed, in collaboration with the 2° Investing Initiative (2DII), the sensitivity of insurance undertakings' investments to climate-change related transitions risks.[61]

209. A forward-looking assessment requires models and assumptions regarding the future developments of climate change and the transition to a carbon neutral economy. In particular, uncertainty exists on the nature and timing of policy actions, technological change and the extent to which financial markets are already reflecting a transition scenario in asset prices. In other words, the results and conclusions obtained can be quite sensitive to the choices adopted for such parameters and assumptions. To capture such uncertainty, the studies mentioned above make use of scenario analysis to analyse a broad range of future states of the world.

210. DNB developed its own bespoke shock scenarios with a policy-induced rise in carbon prices, a technological breakthrough that lowers carbon emissions as well as a combination of both. ACPR/Banque de France and ECB/ESRB used as a basis the climate scenarios developed by the Network for Greening the Financial System (NGFS).[62] The EIOPA sensitivity analysis explores a

56 ACPR (2020); The exercise also considered the impact of an increase in physical risk in a "business as usual" scenario, corresponding to thee RCP 8.5 scenario of the IPCC. The accompanying spreadsheets with the macroeconomic and financial data in the transition scenarios are available here: https://acpr.banque-france.fr/scenarios-et-hypotheses-principales-de-lexercice-pilote-climatique.

57 DNB (2018).

58 ESRB (2021).

59 ECB (2021a).

60 ESRB (2022).

61 EIOPA (2020a).

62 See for the second iteration NGFS (2021).

late and sudden transition to achieve greenhouse gas concentrations consistent with the 'Sustainable development Scenario' and the 'Beyond 2 degrees scenario' developed by the International Energy Agency (IEA).

211. The analyses use two ways to measure the impact of the transition scenarios. ACPR and ECB/ESRB compare the outcomes of disorderly transition scenarios with the baseline results for an orderly transition. DNB and EIOPA measure the impact of the disorderly scenarios relative to the current, no policy change pathways. The timing of the transition shocks ranges from immediate (DNB shock scenarios) to 5 years (ACPR sudden transition scenarios) and 10 years (late transition scenarios of ACPR, ECB/ESRB and EIOPA).

212. The forward-looking assessments employ several models to translate high-level climate scenarios into pathways for equity and corporate bond prices at the sectoral level.

- DNB uses the multi-country macroeconomic model NiGEM to project the impact of the policy and/or technology shock on macroeconomic variables, like interest rates, inflation and unemployment. ACPR and ECB/ESRB calibrate the NiGEM model to reproduce the GDP trajectories in the NGFS scenario and to determine trajectories for other macroeconomic variables;[63]
- Subsequently, the macroeconomic outcomes are segmented into results at the sectoral level. ACPR determines the impact on revenue and value added for 55 NACE activities, considering their carbon-sensitivity both from an input and output perspective. The DNB calculates so-called transition vulnerability factors (TVFs) for 55 NACE activities, measuring the relative sensitivity of equities to a given transition risk. EIOPA – using the 2DII Pacta tool - estimates the required decrease/increase in production for 7 climate-policy relevant sectors and 15 underlying technologies to ensure alignment with IEA scenarios.[64] The ECB/ESRB assess the impact of transition risks on the probabilities of default of individual, non-financial firms;
- Lastly, various financial models are used to translate the sectoral information into impacts on equity and corporate bond prices. ACPR, ECB/ESRB and EIOPA employ a discounted dividend model to project the impact on equity prices at sectoral/firm level. DNB makes use of the TVFs – which are comparable to betas in the capital asset pricing model (CAPM) – to determine deviations of sectoral equity returns from the market return. The impact on corporates bond spreads is determined using internal credit risk models, in which the credit spreads are a function of macroeconomic variables (GDP) as well as variables at sector or firm-level (default probabilities, equity price sensitivities)[65];

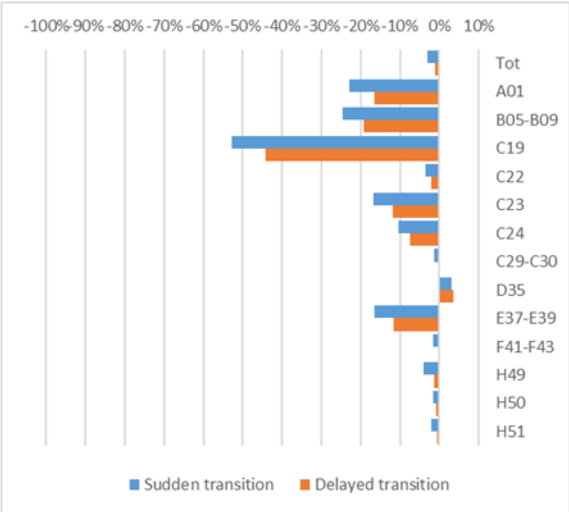
[63] See for description of the methodology, Banque de France (2020).

[64] 2DII (2022).

[65] In the EIOPA sensitivity analysis, corporate bond price changes equal 15% of the equity price changes of the corresponding technology, in line with the assumption made by the PRA / Bank of England.

Figure 3: Impact on equity prices by activity/technology in disorderly transition scenarios

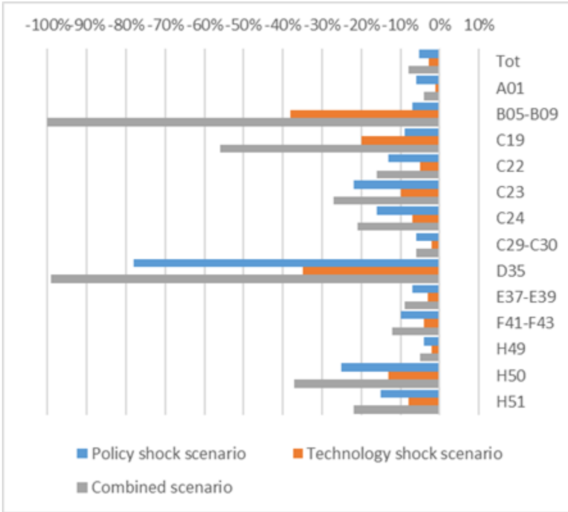
ACPR/BANQUE DE FRANCE [A]



Source: ACPR (2020)

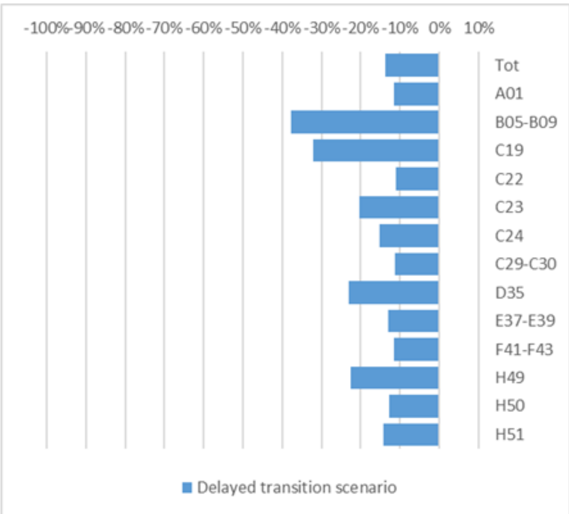
[A] Equity shocks relate to EU stock markets, excluding France.

DNB



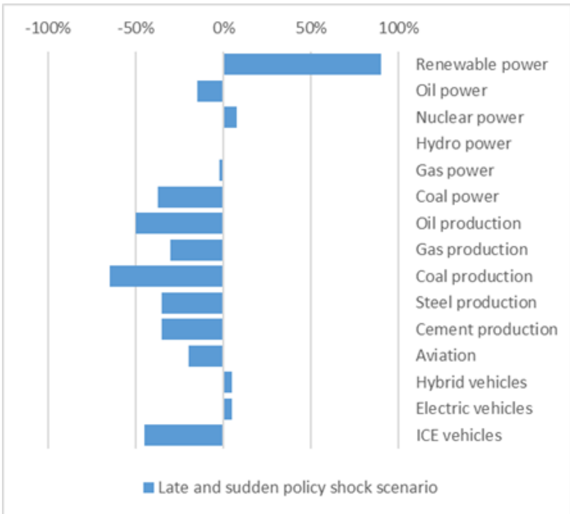
Source: DNB (2018)

ESRB/ECB [B]



Source: ESRB (2022)

EIOPA



Source: EIOPA (2020a)

[B] Total equity shocks relate to the weighted average of the shocks by NACE-activity using value added taken from Eurostat as weights.

Note on NACE-activities – the 13 NACE activities are shown, where available, for which equity prices are most impacted by the transition scenarios of ACPR, DNB and ESRB/ECB.

213. The impact of the disorderly transition scenarios on equity prices for the most relevant NACE activities (ACPR, DNB and ESRB/ECB) and the fifteen climate-policy relevant technologies (EIOPA) is depicted in Figure 3. It makes clear that there are substantial differences in exposures to transition risk for the various economic activities and technologies. On the one hand, equity exposures to mining (B05) and power generation (D35) would be fully stranded in the DNB

combined policy and technology shock scenario. On the other hand, equity exposures to renewable energy would double in value in the EIOPA late and sudden policy shock scenario.

Question to stakeholders

Q60: Do you have suggestions for other forward-looking assessments of transition risk that will help EIOPA in studying transition risk differentials? If yes, please provide these suggestions.

2.7.2. TRANSITION VULNERABILITY FACTORS IN CLIMATE SCENARIOS

214. Although the DNB transition stress test built customised scenarios and did not follow the scenarios of the Network for Greening the Financial System (NGFS), it does produce transition vulnerability factors (TVFs). The TVFs describe the heterogeneity of each economic sector regarding transition risk, depending on the carbon intensity of the sector. In this regard, a forward-looking assessment based on TVFs connects well with the sectoral backward-looking assessment.

215. The advantage of the TVFs is that they can be interpreted as beta factors in a capital asset pricing model (CAPM). The TVFs capture the sensitivity of stock returns to forward-looking scenario-specific excess market returns, for instance in case of a rise in carbon prices or a technological shock. Another interesting feature of the TVFs is that due to their nature, they can be seen as more time-stable than direct asset price elasticities. These relative measures are also a useful tool to cascade-down aggregate shocks, or to aggregate up granular shocks in a weighted-average manner.

216. To get both a forward-looking and stable measure of transition risk for economic sectors in light of different climate trajectories, the TVFs could be mapped onto the orderly and disorderly transition scenarios as well as the hot-house-world scenarios of the NGFS. The NGFS has emerged to a prominent role, providing a framework of different future climate scenarios, encompassing a set of risk factors, in order to generate different plausible future transition pathways.

217. Transition risks mainly stem from a combination of policy and technological factors, differentiated across the economy's transition pathways orderly, disorderly or hot house world (see Figure 4). Within every transition scenario, each transition risk factor is rated as carrying lower, moderate or higher risk levels. Policy risk is translated through policy reaction combined with its geographical fragmentation (i.e. regional policy variation), while technological risk is conveyed via the combination of technology change (transforming economic activities) and the capacity to actively remove CO_2 from the atmosphere.

218. To achieve a forward-looking and stable perspective on transition risk, it is proposed that the TVFs per specific economic activity are mapped onto the NGFS climate scenarios in a parsimonious and pragmatic manner.

Figure 4: NGFS climate scenarios and relevant risk drivers

		Physical risk	Transition risk			
Category	**Scenario**	**Policy ambition**	**Policy reaction**	**Technology change**	**Carbon dioxide removal**	**Regional policy variation**+
Orderly	Net Zero 2050	1.5°C	Immediate and smooth	Fast change	Medium use	Medium variation
	Below 2°C	1.7°C	Immediate and smooth	Moderate change	Medium use	Low variation
Disorderly	Divergent Net Zero	1.5°C	Immediate but divergent	Fast change	Low use	Medium variation
	Delayed transition	1.8°C	Delayed	Slow/Fast change	Low use	High variation
Hot House World	Nationally Determined Contributions (NDCs)	~2.5°C	NDCs	Slow change	Low use	Low variation
	Current Policies	3°C+	None – current policies	Slow change	Low use	Low variation

Colour coding indicates whether the characteristic makes the scenario more or less severe from a macro-financial risk perspective^

- Lower risk
- Moderate risk
- Higher risk

Source: NGFS (2021).

219. The TVFs are provided per 2-digit NACE code, differentiated across three transition shock scenarios (technology shock, policy shock and a double shock, i.e. a combination of technology and policy shock). Concurrently, the NGFS scenarios consider transition risk as a combination of four risk factors, i.e. policy reaction, technology change, carbon dioxide removal and regional policy removal. The risk factors i) policy reaction and ii) regional policy variation can be grouped together to constitute the risk drivers for a policy shock within the TVF framework, and the risk factors iii) technology change and iv) carbon dioxide removal can be grouped together to constitute the risk drivers for a technology shock within the TVF framework.

220. Since within each scenario the NGFS framework attributes a certain risk level to the four risk factors (i.e. lower, moderate or higher risk), the scenario-specific risk level for the policy and technology risk drivers could be subsumed by means of the maximum value of the risk levels of the corresponding individual factors. Pragmatically, the risk level for the double risk driver can be established as the simple average of the risk levels of the policy and technology risk drivers.

- Policy Risk Driver $_{\text{RISK LEVEL}}$ = MAX $_{\text{RISK LEVEL}}$ [Policy reaction; Regional policy variation]
- Technology Risk Driver $_{\text{RISK LEVEL}}$ = MAX $_{\text{RISK LEVEL}}$ [Technology change; CO_2-Removal]
- Double Risk Driver $_{\text{RISK LEVEL}}$ = (Policy Risk Driver $_{\text{RISK LEVEL}}$ + Technology Risk Driver $_{\text{RISK LEVEL}}$) / 2

221. To implement the mapping of the TVFs onto the NGFS scenarios, each risk level (lower, moderate or higher risk) would need to be associated with a coefficient (e.g. 0.5, 0.75 and 1), respectively, to portray a subdued, intermediate or full effect of the risk driver. This final step is important to link quantitatively the TVFs in a given shock scenario (e.g. policy shock) with the risk levels of the corresponding NGFS risk drivers (policy reaction, regional policy variation).

For illustration, in the orderly 'Net zero 2050' scenario, the risk levels for policy reaction and regional policy variation are both moderate, implying a risk level for the policy risk driver of 0.75. The risk levels for technology change and carbon dioxide removal are respectively high (1) and low (0.5), which means that the risk level of the technology risk driver equals 1 (= MAX [1;0.5]). As a result, the risk level of the double risk driver would be 0.875, being the average of 0.75 and 1. Subsequently, the risk levels of the three risk drivers can be used to map the TVFs for each economic activity in the three transition scenarios onto the 'Net zero 2050' scenario. This is achieved by multiplying the risk level coefficient for a certain risk driver (i.e. policy, technology or double) with the TVFs per activity in the corresponding scenario.

222. The TVFs should be considered a risk-oriented metric, measuring the vulnerability of 55 NACE activities to transition risk. As such, the TVFs do not imply a binary green versus non-green classification of economic activities.

223. A possible role of the EU (climate mitigation) taxonomy was considered in the forward-looking assessment, in particular as regards the transition vulnerability. However, the aim of the EU taxonomy is to identify specific economic activities that contribute substantially to climate or other environmental objectives. Although alignment with the EU taxonomy will signal low transition risk, the extent to which aligned activities will benefit from a transition scenario will vary. The taxonomy ignores – at least for the time being – unsustainable and harmful activities, activities that operate between harmful and substantial contribution performance levels as well as activities with a low environmental impact.[66] This means that non-alignment with the EU taxonomy does not allow drawing conclusions on the vulnerability to transition risk. A (binary) approach, where the alignment or non-alignment with the EU taxonomy determines the transition vulnerability of an exposure, was therefore not pursued.

[66] See PSF (2022a).

Questions to stakeholders

Q61: Do you have comments on using the sectoral transition vulnerability factors (TVFs) introduced by DNB (2018) as a forward-looking measure regarding transition risk?

Q62: Do you have comments on the parsimonious and pragmatic way to map the transition vulnerability factors (TVFs) onto the NGFS climate scenarios?

Q63: Do you agree that whether an activity is aligned or not with the (climate mitigation) EU taxonomy does not allow per se to draw conclusion on the vulnerability to transition risk? If not, please justify your view.

2.7.3. RISK DIFFERENTIALS IN TERMS OF VALUE-AT-RISK

224. The forward-looking assessments summarised in section 2.7.1 demonstrate that substantial transition risk differentials seem to exist between economic activities. However, due to their deterministic nature, the scenarios do not provide information on the probability distribution of transition risk-sensitive asset prices over a one-year time horizon. Such information on the probable distribution would be important to establish the size of potential risk differentials in terms of the risk measure used in the solvency capital requirement (SCR) of the Solvency II framework.

225. To express transition risk differentials in terms of the 0.5% VaR, this section discusses and proposes to generate one-year return distributions, including the effects of transition risk, by means of Monte Carlo simulations. The outcomes will very much depend on the probability of a disorderly transition materialising and, if so, on the sensitivity of the asset prices to the disorderly scenario.

Probability of Disorderly Transition

226. Three possible types of transition scenarios can be envisaged in the coming decade (see Figure 5):

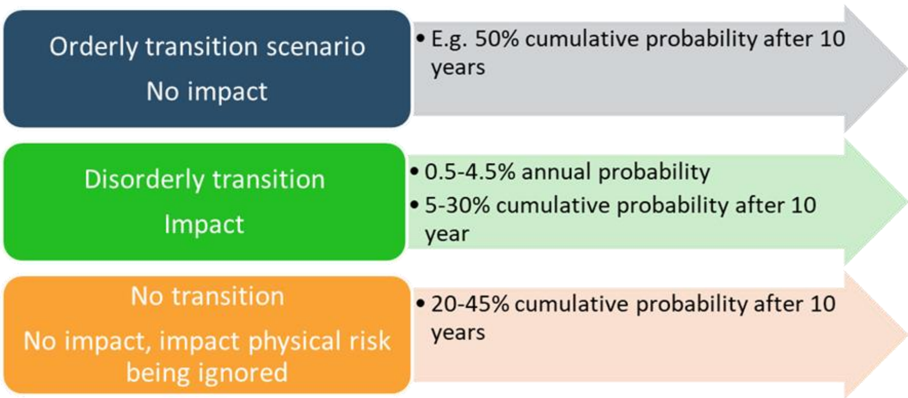
- An orderly type of transition scenario in which there is no or little impact on the real economy and financial sector. This type of scenarios consists of a timely and predictable path to a carbon-neutral economy with companies gradually adjusting their business models and capital stock to this new reality. An orderly transition is considered to be the baseline scenario in the ACPR and ECB/ESRB transition stress tests.

- A disorderly type of transition scenario where there is a substantial impact on the real economy and – through their asset exposures to carbon-intensive sectors – the financial sectors. This type of scenarios tends to be characterised by unexpected, sudden and delayed actions to achieve carbon-neutrality. A disorderly scenario is generally considered to be a low probability, but yet plausible event.

- A type of scenario where there is no transition or an insufficient transition to a carbon-neutral economy. Such a type of scenarios is also bound to have substantial negative impacts on the real economy and financial sector. Not due to transition risk, but as a consequence of a further increase in (acute) physical risks, like floods, fires and storms that may damage production facilities and disrupt supply chains.[67] However, such risk differentials will materialise in another dimension, i.e. depending on the geographical location of companies rather than their carbon sensitivity.

227. Given that a disorderly transition poses the biggest transition risk, a prudential forward-looking VaR-analysis should focus on transition risk differentials relating to a disorderly scenario. Since it is hard to estimate the probability of such a scenario, it is proposed to assess its impact under various annual probabilities of occurrence, e.g. ranging from 0.5% to 4.5% per year. To put these annual probabilities into a longer-term perspective, assume for the sake of illustration that the probability of an orderly transition amounts to 50% during the coming decade. The annual probabilities of 0.5-4.5% will then translate in a cumulative probability of 5-30% after 10 years, leaving a cumulative probability of no (or insufficient) transition of 20-45%.[68]

Figure 5: Three possible types of transition scenarios



Source: Own Figure.

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[67] The ECB economy-wide climate stress test of September 2021 shows that the change in banks' expected losses on their credit portfolio is more than twice as large for a physical risk scenario (hot house world) compared to a disorderly risk scenario.

[68] The cumulative probability equals the sum of the probabilities that a disorderly transition occurs in each year, given that there was no disorderly transition in the previous year(s), and subject to the condition of no orderly transition, multiplied by the probability of no order transition. I.e. $P(\neg A) \cdot \{P(B|\neg A) \cdot [1 + (1 - P(B|\neg A)) + .. + (1 - P(B|\neg A))^{10-1}]\}$, where $P(\neg A)$is the probability of not having an orderly transition scenario and $P(B|\neg A)$ the conditional probability of a disorderly transition scenario given that there is no orderly scenario. In terms of the unconditional probability of a disorderly scenario used in the text, the cumulative probability can be rewritten as $P(\neg A \cap B) \cdot \left[1 + \left(1 - \frac{P(\neg A \cap B)}{P(\neg A)}\right) + .. + (1 - \frac{P(\neg A \cap B}{P(\neg A)})^{10-1}\right]$, where $P(\neg A \cap B)$is the unconditional probability of having a disorderly transition and no orderly transition.

Monte Carlo Simulations

228. A statistical model can be assumed in which the one-year asset return depends on:

- a normally distributed market return, which is the same for all investments within an asset class, irrespective of their carbon-sensitivity (historical component);
- an additional probabilistic disorderly transition return shock, which is uncorrelated with the market return (forward-looking component).

229. The standard deviation of the normally distributed market return can be calibrated to reproduce the 0.5% VaR for respectively type 1 equities,[69] bonds and loans,[70] and property[71] in the SCR standard formula.

230. The workings of such a model are illustrated in Figure 6 for the case of equities based on 15,000 simulations.[72] The orange bars constitute the annual equity market return distribution, ignoring any transition shocks, resulting in a 0.5% VaR of -39%. The blue bars represent the joint distribution, adding with a 4% probability of occurrence an additional transition shock of -40% on top of the market return. The resulting fat-tailed distribution, relative to the normal market return distribution, is characterised by a 0.5% VaR of -51%. In other words, in this example, the risk differential between transition-sensitive and transition-insensitive equities would be -12%-point in terms of 0.5% VaR.

231. To illustrate the sensitivity of outcomes to the main assumptions, the risk differentials in terms of 0.5% VaR (vertical axis) are shown in Figure 7 for different shocks sizes (horizontal axis) and annual probabilities of occurrence (coloured lines). The impact on the risk differential increases with the shock size and the annual probability of occurrence. However, shock sizes smaller than -20% will barely impact the 0.5% VaR. For example, if the market return is 0% and the disorderly transition shock is -20%, then the total return observation will not contribute to changing the 0.5% VaR of -39%.

232. The effect on the risk differential increases markedly when moving from a 0.25% to a 0.75% annual probability of occurrence, in particular for larger assumed shock sizes. The reason is that the addition of large negative shocks with a probability of 0.25% will not affect the 0.5% VaR directly, but only indirectly by shifting the location of the 0.5 percentile on the density curve to

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[69] One-year equity returns can be calibrated to a normal distribution with μ=0% and σ=15.2% to reproduce the 0.5% VaR of -39% for type 1 equities, excluding the symmetric adjustment.

[70] One-year corporate bond returns can be calibrated to a normal distribution with μ=0% and σ=4.8% to reproduce the 0.5% VaR of -12.5% for bonds and loans with CQS=3 and a duration of 5 years.

[71] One-year property returns can be calibrated to a normal distribution with μ=0% and σ=9.4% to reproduce the 0.5% VaR of -25% for property investments.

[72] I.e. 15,000 draws from the normal distribution of market returns as well as 15,000 randomly generated evenly distributed numbers between 0 and 1 with the transition return shock being added to the market return if the random number is smaller than the annual probability of occurrence (e.g. 4%).

the left. I.e. 0.25% of the observations to the right of the 0.5 percentile will move to the left of the original 0.5 percentile.

233. Something similar happens, when positive transition return shocks are considered instead of negative shocks. For example, investments in renewable energy may increase in value in a disorderly transition scenario. However, the effects of positive and negative shocks on risks differentials are not symmetric with (large) positive shocks not having a material impact on the 0.5% VaR. The location of the 0.5 percentile will move to the right, but only slightly. Given the low annual probabilities of occurrence considered, only few observations will experience a positive shock that cause these observations to shift from the left to the right of the original 0.5 percentile.

Figure 6: Change in return distribution for example with annual probability of 4% (cumulative 28% after 10 years) of shock of -40% - N=15,000

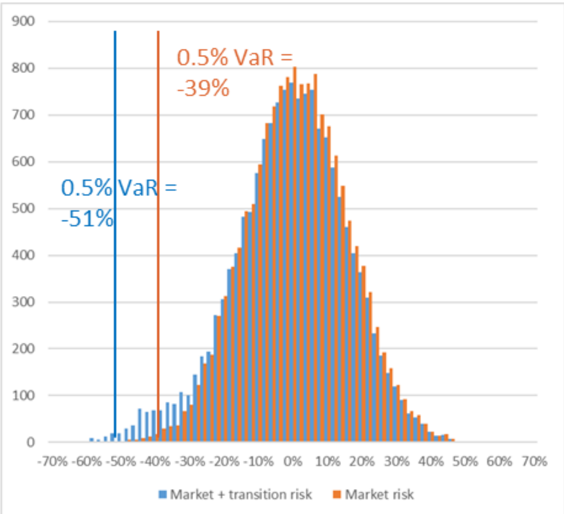
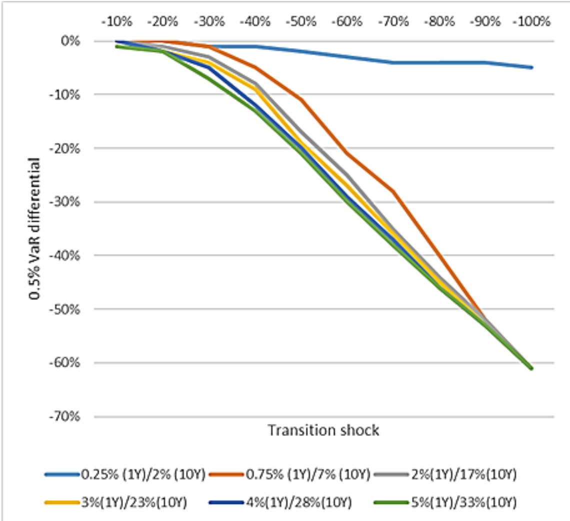


Figure 7: Impact on 0.5% VaR (y-axis) of different shock sizes (x-axis) under different probabilities of occurrence



Source: Own calculations.

Transition Shocks and other Assumptions

234. The illustrative example above assumes an arbitrary shock size of -40% for equities in a particular economic sector when a disorderly transition materialises. More plausible shock sizes can be obtained by utilising the projected equity and corporate bond shocks for the different economic sectors being distinguished in:

- the sudden and delayed transition scenarios of ACPR;
- the policy shock, technology shock and double (or combined) shock scenarios of DNB; and
- the delayed transition scenario of ESRB/ECB.

In the Monte Carlo simulations, if a disorderly transition scenario materialises, a probability of 1/6 could be attached to each of these six specific scenarios occurring.

235. Some adjustments would be needed, though, to incorporate them in the analysis. Firstly, to filter out common market risk, the shocks may need to be adjusted to represent the difference in the percentage change of the asset class per NACE category relative to the average percentage change per asset class. Several other adjustments to the shock may be necessary, such as the transposition from the GICS to the NACE classification,[73] and the transformation of credit spread shocks into bond price shocks.

236. The proposed Monte Carlo analysis does not consider the time dimension underlying the transition scenarios. The three DNB scenarios are assumed to materialise in the present, ACPR's sudden transition scenario in a time horizon of five years and the delayed transition scenarios of ACPR and ESRB/ECB in a time horizon of ten years. Instead, the analysis assumes that all scenarios are equally likely to materialise within one year. The advantage is that the analysis captures parameter uncertainty and sensitivity to different scenario assumptions, while yielding results that are representative for a longer time period.

237. A drawback of the NACE classification is that the categories are quite broad. As such, the NACE categories may contain activities that are negatively impacted by a transition scenario as well as activities that benefit from a transition scenario. The transition shocks from EIOPA's sensitivity analysis could be used to supplement the six climate scenarios with a further breakdown of the following NACE-level shocks:

- Mining and Quarrying (B05-B09), broken down by oil, gas and coal;
- Electricity, Gas, Steam (D35), broken down by renewable, oil, nuclear, hydro, gas and coal power; and
- Motor vehicles and Transport (C29-C30), broken down by hybrid, electric and internal combustion engine (ICE) vehicles.

238. The equity and corporate bond shocks from the EIOPA/2DII analysis would have to be adjusted to make them consistent with the six disorderly transition scenarios of ACPR, DNB and ESRB/ECB. A similar approach as in the ECB/ESRB report on climate-related risk and financial stability could be envisaged.[74]

[73] The supporting spreadsheets of the ACPR climate pilot exercise contain a correspondence table with a mapping from GICS companies to NACE activities.

[74] See ESRB (2021), pp. 71-73.

Question to stakeholders

Q64: Do you agree with the proposed approach to express transition risk differentials for different economic activities in terms of 0.5% Value at Risk (VaR)? If not, please provide your suggestions to improve the proposed approach.

Property Shocks by Energy Performance Labels

239. The transition scenarios of ACPR, DNB and ESRB/ECB do not contain information on the price impact on property with different energy efficiency levels. To assess forward-looking transition risk differentials in terms of value at risk for property with different energy labels, the development of property values would have to be projected in the six climate scenarios. This requires estimates of property price elasticities regarding changes in energy prices to provide a linkage to the development of carbon/energy prices in the six climate scenarios.

240. A study by Copenhagen Economics (2015) provides both empirical and theoretical estimates of the sensitivity of house prices with different energy labels to changes in energy costs. The empirical approach is based on current data on sales prices of houses with different levels of energy efficiency and energy prices, while the theoretical approach is based on the present value of future energy savings due to a higher energy efficiency. The house price effects found using the different approaches differ significantly, the theoretical price elasticities being almost six times larger than the empirical ones. A drawback of the Copenhagen Study is that it only analyses the residential market in Denmark and does not consider the commercial real estate sector.

241. Using information in the report on house prices and energy consumption for the different energy labels, the forward-looking impact of higher energy prices on house prices with different energy labels can be estimated. Subsequently, the estimates can be used to illustrate property price differentials for buildings with different energy labels (relative to the D label) in the transition scenarios considered by ACPR, DNB and ECB/ESRB, which contain information on the development of carbon/energy prices. The analysis could be done for both residential property and commercial property, assuming that the price impacts are the same.

Questions to stakeholders

Q65: Do you agree that the forward-looking assessment should also consider commercial and residential property based on energy efficiency labels? Please explain your answer.

Q66: Do you have any suggestions that will help EIOPA in projecting forward-looking prices of commercial and residential property based on energy efficiency labels in different transition scenarios?

3. UNDERWRITING AND CLIMATE CHANGE ADAPTATION

242. The detrimental impact of global warming on natural and human systems is already visible today and without further international climate action, global average temperature and associated physical risks will continue to increase.[75] Insurance undertakings play an important role in the mitigation and adaptation to climate change through their investments, products and services. Through its ongoing work on sustainable finance, EIOPA aims to ensure that (re)insurers integrate sustainability risks, and in particular climate risks, in their risk management to protect consumers and secure financial stability. This contributes to securing a sustainable and resilient insurance sector, providing relevant and affordable insurance coverage to consumers and firms.

243. In 2021, EIOPA published a methodological paper to consider the impact of climate change on EU insurers' solvency capital requirements for natural catastrophe risk, as the frequency and severity of extreme climate- and weather-related events is expected to increase materially in future. The methodological paper highlights perils and countries which may be materially impacted by climate change and elaborates on how to include climate change in the Nat Cat SCR calibration in Solvency II's Standard Formula to ensure policyholder protection and stability of the EU insurance market.[76]

244. Moreover, EIOPA issued in May 2022 a discussion paper on European insurers' exposure to physical climate change risk and potential implications for non-life business.[77] The report presented results based on a data collection exercise from the industry and focused on property, content and business interruption insurance against windstorm, wildfire, river flood and coastal flood risks, as these risks were identified as the most relevant and potentially most disruptive for the European property insurance business under a current and forward-looking perspective.

- The analysis shows that the non-life insurance sector's ability to continue to provide financial protection in light of climate change relies on its ability to measure the impact of climate change on loss exposures and to adapt its business practices and strategies to climate change.

[75] IPCC (2022); IPCC (2018).

[76] EIOPA (2021b).

[77] EIOPA (2022a).

- This discussion paper also gives an estimation of the recent tremendous claims non-life insurers had to bear because of natural catastrophic events. For instance, in relation to the 2020 windstorm Ciara, companies reported claims amounting to EUR 816 million, of which two thirds arose from residential exposures. The claims were concentrated both geographically, and in a very small number of insurers.
- Windstorm risk is shown as being already the most insured climate-related hazard (accounting for EUR 42.6 trillion in terms of exposures for building, content and business interruption – e.g. due to distribution or production chain disruptions), followed by river flood (EUR 28.9 trillion), wildfire (EUR 22.8 trillion) and coastal flood (EUR 9.1 trillion). The future evolution of these events will have major impacts on the non-life (re)insurance sector.

3.1. ADAPTATION MEASURES IN THE NON-LIFE INSURANCE CONTEXT

245. Many non-life lines of businesses are expected to be impacted by physical climate-related risks and there is an emerging consensus among insurers that premium levels are likely to materially rise in the future. Rising premium levels and changes in insurance conditions (e.g. higher deductibles, lower coverage limits and exclusions in risky areas) may lead to detrimental consequences for policyholders and the insurance sector itself (e.g. in terms of reputational risk). In this regard, climate change could have substantial negative impact on the availability and affordability of non-life insurance products in the future.

246. Climate-related adaptation measures, for example water-resistant external walls in case of flood risks, reduce the policyholder's physical risk exposure and insured losses. As such, they can be considered a forward-looking tool to reduce the adverse consequences of climate change on physical risk exposures and to maintain the long-term availability and affordability of non-life insurance products in light of climate change. Given the importance of insurers as risk managers for societies and economies, climate change adaptation in non-life insurance is considered an important environmental objective in light of climate change, underlined by its inclusion in the EU Taxonomy.

247. In its current work on impact underwriting, EIOPA focuses on the potential for insurance undertakings to contribute to the adaptation of societies and economies to climate change. By means of data, risk assessment and expertise, insurance undertakings can promote and incentivise policyholders to take up climate-related risk prevention measures.[78] In this regard, EIOPA is conducting a Pilot Exercise on Climate Change Adaptation in Non-Life Underwriting and Pricing with volunteering undertakings in 2022. The Pilot Exercises aims to better understand

[78] EIOPA (2021a).

how insurers integrate climate-related adaptation measures in non-life underwriting practices and to foster discussion and knowledge sharing across the industry.

248. In this chapter, EIOPA builds on its work on impact underwriting and focuses on the potential effects of climate-related adaptation measures on underwriting risks from a prudential perspective. If a significant difference in the prudential risks for insurance products with and without climate-related adaptation measures exist, risk-based capital requirements should recognize it properly.

3.2. DEFINITION AND EXAMPLES OF ADAPTATION MEASURES

249. The scope of climate-related hazards for the proposed study about the prudential treatment of climate-related adaptation measures in non-life insurance is set out in Annex A of the EU Taxonomy Climate Delegated Act supplementing Regulation (EU) 2020/852, as reported in Table 5 in the Annex.

250. For the purpose of this report, climate-related adaptation measures are defined as structural and non-structural measures and services that are implemented by (re)insurance undertakings or policyholders ex-ante to a loss event, which reduce the policyholder's physical risk exposure to climate-related hazards through i) lowering the frequency of climate-related losses or ii) lowering the intensity of climate-related losses.[79]

251. Climate-related adaptation measures can differ substantially regarding their form and ability to protect against climate-related hazards. Examples of climate-related adaptation measures comprise: building improvements like water-resistant walls, windows and doors or non-return valves on main sewer pipes against flood risk, sandbags or domestic flood protection walls against flood risk, heat- and fire-resistive construction materials for buildings against exterior fire exposure, irrigation of crop fields against drought risk and heat waves, forecasting and warning systems (e.g. SMS) to support the protection of goods against severe weather events.

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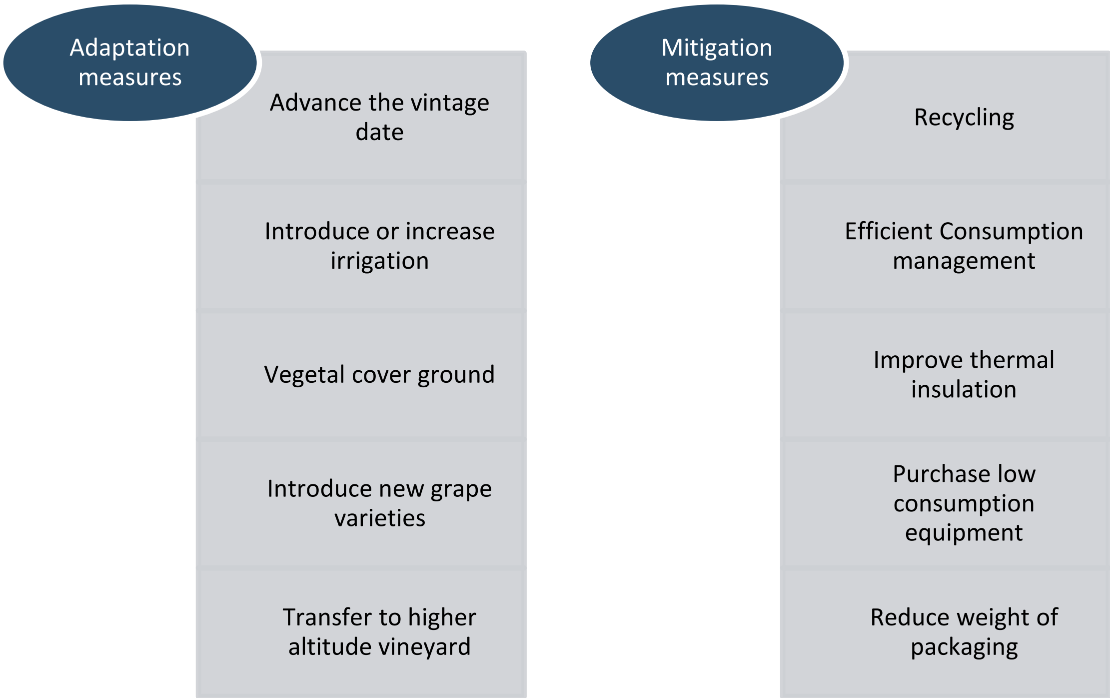
[79] One should note that, according to the definition set, the present study does not consider climate-related adaptation measures that are publicly funded, such as, for example, flood defenses like dikes implemented by local governments. The definition is related to EIOPA's work on impact underwriting, which focuses on measures that can be applied directly by undertakings or policyholders.

3.3. DIFFERENCE BETWEEN ADAPTATION AND MITIGATION MEASURES

252. Climate-related adaptation measures are considered to reduce the effects of climate change on policyholders' physical risk exposures and losses, whereas mitigation measures are actions aiming to limit and reduce greenhouse gas (GHG) emissions.

253. For illustration purposes, Figure 8 lists different adaptation and mitigation measures suggested for the Spanish wine sector.[80] In particular, the purchase of equipment requiring low energy consumption, or the reduction of packaging weight are mitigation measures, as they reduce GHG emissions associated with wine production. However, such measures cannot be considered as climate-related adaptation measures, as they do not influence the policyholders' climate-related physical risk exposures.

Figure 8: Adaptation versus Mitigation Measures for the Spanish Wine Sector



Source: Own Figure.

254. While mitigation measures are out of the scope of the intended analysis, one should note that climate change mitigation is becoming increasingly relevant for the insurance market as

[80] Garcia-Casarejos et al. (2018).

illustrated, for instance, by the Net-Zero Insurance Alliance (NZIA), which aims to transition underwriting portfolios to net-zero GHG emissions by 2050.

3.4. ADAPTATION MEASURES AND PRUDENTIAL UNDERWRITING RISKS

255. Insurance premiums are based on the expected volume of an underwriting pool's claims and should be sufficient enough to cover incurred claims over a given time period, which is usually one year for non-life insurance contracts.

256. Climate change is expected to substantially raise the frequency and intensity of climate-related losses for certain non-life insurance lines over time, and to regularly cause unprecedented claim events.[81] Therefore, climate change might raise the volatility of the claims' distribution, thereby raising the risk that the undertaking has not sufficient premium income to cover the incurring claims in a given year. In case of a misalignment in the consideration of climate-related trends in the premiums and claims of an underwriting pool, premium risk can raise.

257. Climate-related adaptation measures may smooth the claim distribution by reducing the frequency or intensity of climate-related losses. In that regard, the risk of mispricing insurance policies due to climate change might be reduced and underwriting pools with and without climate-related adaptation measures might show significantly different underwriting profiles. Premium risk in Solvency II's Standard Formula captures the risk that the undertaking has mispriced insurance policies and, therefore, has not enough premium income to cover incurring claims. For example, climate change might have for consequence a substantially different claim behaviour than the one expected from the historical time series to create a climate-related price trend for the insurance policies (prediction error). The one-year development of claims and premiums might become materially disentangled, and the underwriting pool's premium income might not be sufficient to cover all claims incurred in a one-year time horizon.

258. Under Solvency II, premium risk relates to the adverse variation of the underwriting pool's claims around their expected value in a one-year time horizon, and has been calibrated by means of the volatility of the underwriting pool's loss ratio. There are two distinct components for premium risk in the Standard Formula that could be affected by climate-related adaptation measures.

259. Firstly, the volume measure in terms of the net premiums earned is expected to decrease for climate-related adaptation measures, as the actuarial premium level of a policy should be lower due to reduced physical risk exposures. However, the potential decline in the actuarial

[81] IPCC (2021).

premium and the net premium does not have to be equal, as the market pricing of insurance policies typically takes additional aspects into account like profitability or market demand for the insurance product. Moreover, the volume measure based on the net premiums earned is not informative about the potential variation of the claims around their expected value, which is the important determinant for premium risk from a prudential perspective.

260. Secondly, the standard deviation, capturing the variation of claims around their expected value, is used to estimate extreme potential variation of the underwriting pool's claims in a one-year time horizon. The behaviour of the standard deviation in conjunction with climate-related adaptation measures is difficult to predict, as the claim-related effect resulting from risk prevention depends on the exact portion of losses around the mean value that gets mitigated. For instance, risk reduction based on non-proportional reinsurance typically reduces the volatility of claims, and in that regard, Solvency II provides a corresponding volatility adjustment factor for premium risk in certain non-life lines of business (Art. 117, Delegated Regulation 2015-35).

261. It is likely that climate-related adaptation measures do not show a linear effect in risk reduction, i.e. incremental increases in the risk exposures do not get equally reduced. For instance, sandbags are only able to reduce claims up to a certain flood level, and flood levels beyond that threshold will raise the claims substantially. Moreover, non-life insurance contracts are typically multi-risk contracts, implying that climate-related adaptation measures that typically focus on a specific climate-related peril can only affect certain parts of the entire claim distribution. Therefore, if risk reduction associated with climate-related adaptation measures realizes in non-proportional effects, a reduction in the standard deviation of the claims could be expected, resulting in lower levels of premium risk.

262. As physical risk exposures will be lower due to risk prevention, technical provisions for claims will also be lower. Regarding reserve risk, climate-related adaptation measures are expected to reduce the volume measure in terms of the net provisions for claims outstanding. However, adaptation measures should not have a material impact on the costs to settle the claims that have already occurred in the past. Therefore, it is not expected that climate-related adaptation measures will have an impact on the standard deviation for reserve risk.

263. Natural catastrophe risk is covering potential losses from extreme and rare tail events, which are however expected to happen more frequently due to climate change. Under Solvency II, undertakings can take the risk reducing effect of climate-related adaptation measures into account when applying a suitable catastrophe model for estimating the corresponding capital requirements. However, the effects of climate-related adaptation measures on the solvency capital requirements for natural catastrophe risk are difficult to predict, as they depend substantially on the catastrophe model used, the climate-related hazard considered, the risk characteristics of the adaptation measure modelled and the localisation of the risk exposure. Moreover, for example large-scale and expensive adaptation measures like flood-resistant walls

might raise the value of a house, and thereby raise the sum insured in the underwriting pool, which in turn will raise the corresponding solvency capital requirement.

264. EIOPA intends to focus its quantitative analysis of the prudential effects of climate-related adaptation measures on premium risk as a starting point. In this regard, EIOPA conducted an underwriting data collection with insurance undertakings in the second quarter of 2022. Reserve risk and natural catastrophe risk are intended to be studied by means of qualitative questions that have been raised in the data collection. Future quantitative work could also look more deeply into the quantitative influence of adaptation measures on the solvency capital requirements for natural catastrophe risk, which, however, requires a dedicated data collection materially different from the one for premium risk.

Question to stakeholders

Q67: Do you have comments on the expected conceptual impact of adaptation measures on premium, reserve and natural catastrophe risk in Solvency II?

3.5. LOSS MODELS

265. The literature does not provide much quantitative findings on the effect of climate-related adaptation measures on physical risk exposures, and on premium risk in particular. It is therefore unclear, how and to what extent climate-related adaptation measures could influence corresponding solvency capital requirements for non-life insurance undertakings.

266. Moreover, it appears that internal models of, at least European insurance undertakings, do not explicitly take the effect of climate-related adaptation measures on the SCR for non-life risk into account. Thus, those models could not be used to assess the general relevance and effect of climate-related adaptation measures.

267. Nevertheless, the topic of adaptation measures has been a key area of work for some nat-cat model vendors and (re)insurers since many years. Indeed, if the capital requirements calculations were not an area where adaption measures were deeply considered in the insurance sector, pricing was on the contrary an area of focus. In the following sections, EIOPA presents several case studies that provide valuable insights on the risk reducing effect of climate-related adaptation measures on the potential loss that could arise from climate-related hazards.

Case study 1 - Study on Flood Risk, 2022, RMS

In 2021, RMS ran a three-part webinar series about past, present, and future flood risk in five key European cities (Cologne, London, Paris, Prague, and Zurich). The third part focused on flood risk management and with a focus on examples of how climate-related adaptation measures help reduce potential damage from fluvial and pluvial flooding. EIOPA will focus in this case study on the impact of climate-related adaptation measures as demonstrated in that study for Zurich and Paris.

The analysis presented in the study is based on the latest version of the RMS Europe Inland Flood HD Models, released in 2020. The models cover 14 countries in Europe, across a single probabilistic event set, allowing us to capture the complete flood risk correlation across territories.

The RMS models are based on physical risk modelling, starting with precipitation, which allows for capture of all sources of inland flooding, including fluvial (i.e., river) and pluvial (i.e., flash flood and small river system). This is a critical element as over 50 percent of insurance claims happen outside the main flood plains in Europe.

Physical risk modelling also enables climate conditioning of the event set to reflect different future climate scenarios. Unlike static scenarios and simpler risk scoring, using probabilistic modelling for reflecting climate change allows for the quantification of future climate risk, providing similar metrics traditionally used in the insurance industry, such as average annual loss (AAL), return period loss, and impact on frequency.

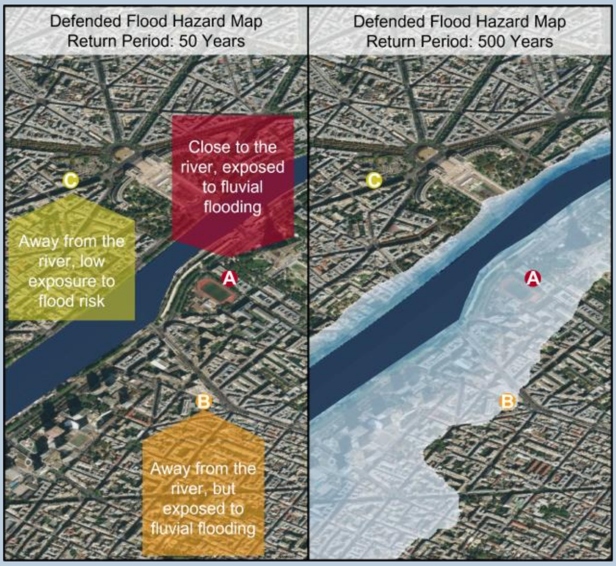
In addition, this study uses a functionality of the RMS model: Both the location-level flood defence assumptions, known as property flood resilience (PFR), and standards of protection of the large fluvial defence systems can be adjusted. This will be illustrated in the Zurich and Paris examples.

For both examples one near- and one long-time horizon were chosen: 2030 and 2050. Two Representative Concentration Pathway (RCP) scenarios were chosen to reflect the uncertainty in future greenhouse gas (GHG) emissions: RCP2.6 and RCP8.5. RCPs are the commonly used scenarios that describe different climate futures depending on the volume of GHG emitted in the years to come. RCP2.6 assumes active climate change mitigation measures are applied and GHG emissions start declining from 2020 onward. RCP8.5 represents a "business as usual" behaviour and is considered a worst-case scenario with rising GHG emissions throughout the end of the century.

All analyses show that climate-related adaptation measures clearly reduce potential property-damage loss in areas exposed to flood risk.

Paris

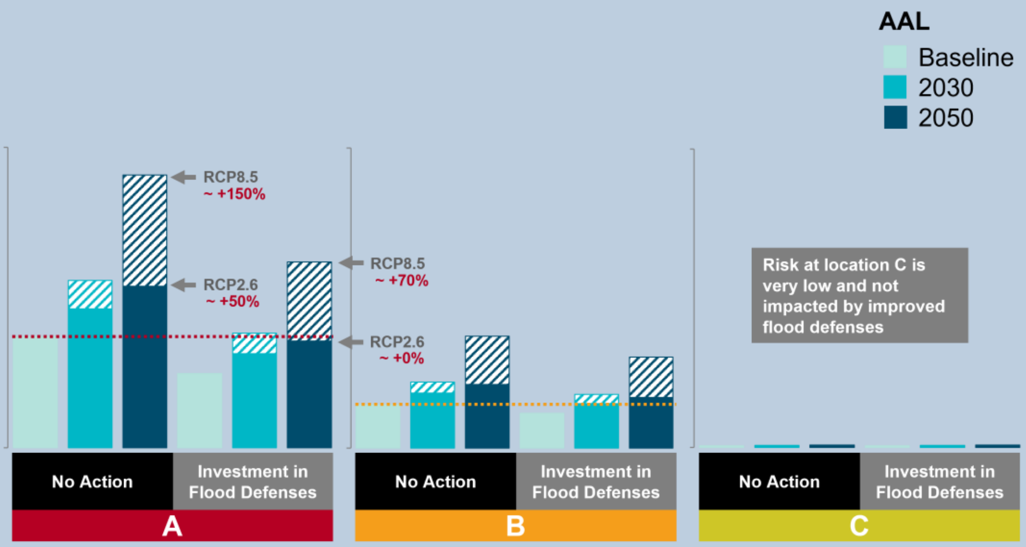
Three Paris locations – A, B, and C – with different flood risk profiles were chosen, as shown on the map. Locations were coded as multi-family dwelling, masonry, and with a basement. Similar other building attributes as well as insured values (building and contents) were used to allow comparison between locations.



Looking at the 1-in-50-year flood hazard map (left), none of the three locations appear to be exposed to significant flood risk at the lower return periods. Nevertheless, the situation is different for rarer events, that is, at higher return periods. Indeed, in the 1-in-500-year map (right), we can see the impact of the primary flood defences being overwhelmed in locations A and B.

To demonstrate the impact of adaptation measures on potential property losses, the RMS Europe Inland Flood HD Models and corresponding RMS Climate Change Models were leveraged to simulate the impact of improved fluvial flood protection. In addition, it is assumed that the standard of protection (SoP) had increased by 50 percent. SoP is a model parameter that can be adjusted by the user and represents the level up to which exposed assets are protected by fluvial flood defences in today's climate conditions. SoP is represented as a return period (e.g. a design standard equal to 100 years means that the defence is designed to hold up against a 100-year discharge of water level at today's levels).

The following graph illustrates the results of the simulations for each location.



For location A, which is most exposed to fluvial risk, the investment in improved flood defences substantially reduces today's flood risk. Under scenario RCP8.5 in 2050, the losses driven by climate change were reduced from around +150 percent, relative to the current risk, to approximately +70 percent if defences are improved. Under scenario RCP2.6, despite increasing precipitation leading to a 50 percent increase in loss by 2050 with no adaptation measures, the defence improvements shown here almost entirely mitigate this increase and contain losses to current levels.

The effect is less remarkable for location B but is still significant as evident by the clear reduction of AAL displayed in the graph. Since Location C is not affected by fluvial flooding from the Seine, it does not benefit from the improved flood defences.

Zurich Case Study

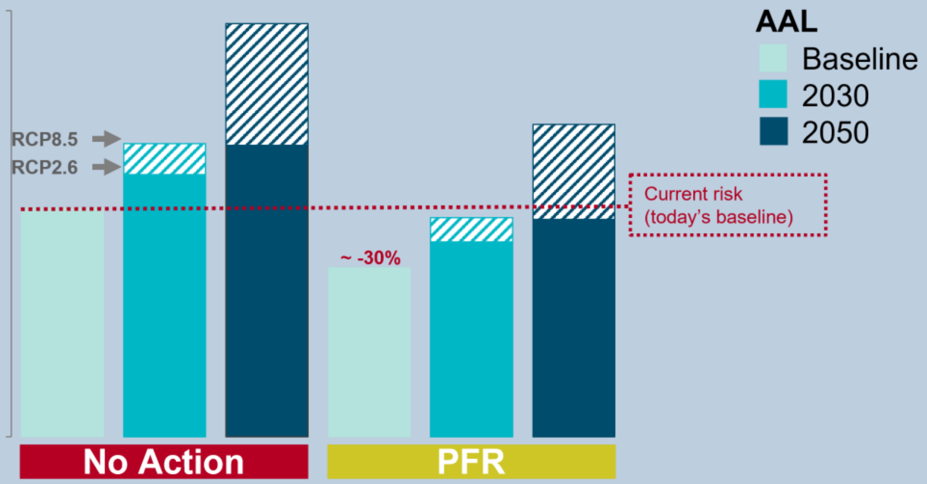
RMS models allow us to assess the impact of many different PFR measures such as sandbags, floodwalls, raised ground floors, dry- and wet-proofing, etc. For the Zurich case study, RMS:

- Assessed the impact of flood protection measures at the property level, as opposed to the impact of investments in large river protection measures (e.g. heightening of dams and levees)

- Analyzed the effects of installing a 0.5 meter floodwall (a PFR measure) at every commercial property in the city of Zurich because the largest portion of the potential losses are from commercial buildings

- Did not apply any adaptation measures to residential and industrial properties

The following graph illustrates the results of the simulations.



Implementing the specific adaptation measure at the property level, the floodwall, reduces today's flood risk by almost 30 percent. Losses under both RCPs in 2030 are lower than current levels when defences are improved. That is, risk adaptation from defence improvements outweighs the increase in risk due to climate change over this time horizon and also at the 2050-time horizon for RCP2.6 (but not for RCP8.5). Similar analyses can be performed to examine what level of defence improvements are required to limit future losses to current levels under any given RCP and time horizon.

Case study 2 - UK study on property flood resilience considering climate change adaptation, 2022, JBA Risk Management

JBA Risk Management has led a preliminary study to determine the level of Property Flood Resilience (PFR) uptake on residential properties that might mitigate the effect of climate change on property losses in the UK under different climate scenarios. PFR includes the use of flood gates, waterproof plaster, solid concrete floors and tiled floor coverings, raised electric sockets or simply moving paperwork and valuables to higher levels to protect a property.

For the purpose of this study, RCP 4.5 and RCP 8.5 were the future scenarios used and a time horizon of 2050 was chosen. JBA considered two types of vulnerability for the analysis, a set of assumptions with no PFR and one that was adapted to include protective measures.

The following table shows the result of the simulation using JBA's UK market residential exposure. This clearly illustrates the mitigation power of climate- related adaptation measures on the average annual losses:

Scenario	Loss (£) - No PFR	Properties Updated	*Loss Mitigation (£)	Loss Mitigation (%)
Baseline	487,058,630	-	-	-
RCP4.5	838,541,312	238,994	365,391,958	43.57
RCP8.5	909,087,658	323,471	453,066,154	49.84

**The loss mitigation brings the combined flood loss slightly below the present-day (baseline) view. This is a legacy of the method employed in this study.*

The table can also be interpreted as follows:

- Properties Updated refers to the number of properties that have had PFR measures applied

- Under RCP4.5, PFR measures at only 3% (238 994 properties out of the total number of properties) of UK properties would mitigate the climate change affected loss to residential properties

- Under RCP8.5, PFR measures at only 4.1% (323 471 properties out of the total number of properties) of UK properties would mitigate the effect of climate change on loss to residential properties

The Flood Re Build Back Better scheme is a UK privately led initiative designed to reduce the cost and impact of future floods by including property resilience measures as part of flood repairs, up to the value of £10,000.** Based on the simple assumptions of this preliminary study, JBA calculate an estimated payback period for the Build Back Better scheme under RCP8.5: An initial investment of £3.2 Billion (£10,000 for 323,471 properties) could lead to an annual loss mitigation of £453m. A conservative payback period is therefore only 7.1 years when assuming no interest rates effect and assuming flood risk exposure and costs of rebuild are kept at present day levels.

***It has been understood that the FloodRe 10k incentive is intended to cover varying levels of PFR depending on the size and location of a property and inflation. In this study the £10,000 is used based on Flood Re's 'Build Back Better' scheme but JBA have not performed any cost analysis on this figure.*

Case study 3 - Verisk analysis on improvements on flood risk metrics when adaptation measures are in place compared to present-day scenarios

Verisk conducted loss analyses to estimate improvements on flood risk metrics when mitigation measures are in place compared to present-day scenarios. The cases examined involved (1) increasing local public protection measures against riverine flooding and (2) implementing building-level flood mitigation measures.

(1) <u>Impacts of Riverine Protection Measures on Flood Risk Metrics</u>

This study was made on 1006 postal codes in the region in the west of Germany that was most affected by the flooding in July 2021 caused by the low-pressure system "Bernd".

Analyses were carried out using a model, where standards of protection such as levees, dikes, and flood walls are explicitly included. The method used also provided the flexibility of coding a custom standard of protection at the location level and could be defined as either a height of water depth or a return period, up to which a location is protected from on-floodplain losses (where "on-floodplain" is defined from all rivers with a catchment area of 10 km^2 or greater).

Scenarios analysed looked at increasing the standard of protection return period by 25% (i.e. locations with a standard of protection up to 100 years received protection for on-floodplain events corresponding to up to a 125-year return period; Scenario 1) and at implementing a minimum standard of protection of 200 years throughout the case study domain (Scenario 2).

Results from the detailed loss analyses carried out on the different scenarios were aggregated by postal code and are presented in the graph below:

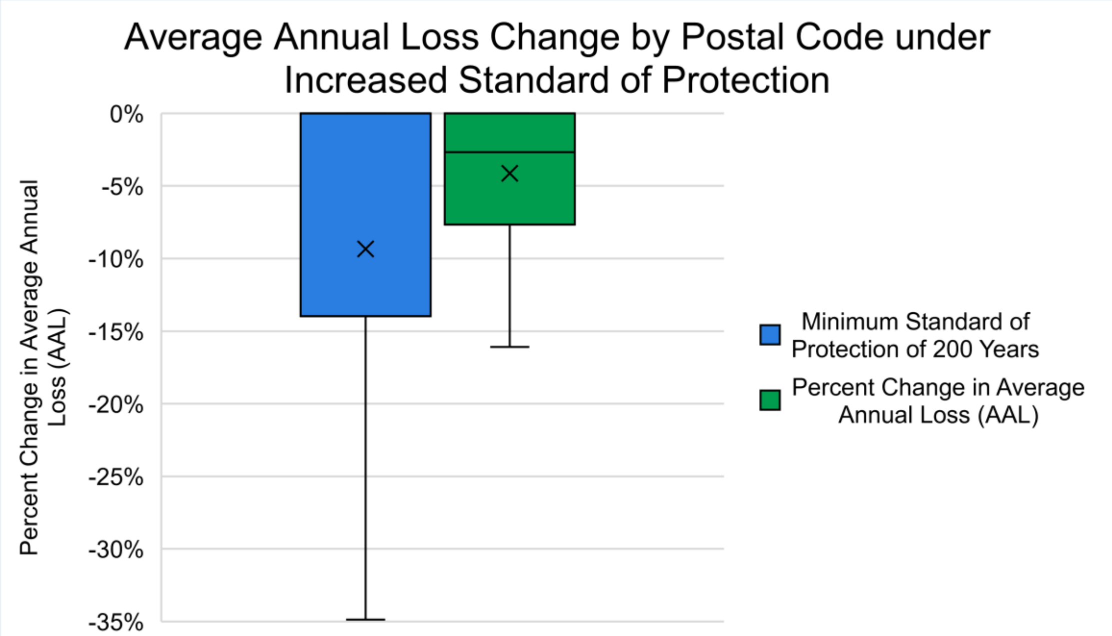


Figure: Distribution of AAL change by postal code under scenarios 1 and 2 (X indicates mean value, solid line is median).

Generally, the proportional increase in defence from the on-floodplain component (Scenario 1) resulted in a decrease in both average annual flood loss (AAL) and 100-year tail value at risk (TVaR) on the order of 2-5% by postal code, with a maximum impact on certain postal codes on the order of 15%. Aggregated over the entire modelled exposure, an AAL as well as 100-year TVaR reduction of 6% was achieved.

Moreover, the scenario of implementing a standard of protection at all streams against floods of at least a 200-year return period (Scenario 2) achieved a reduction of up to 35% for some postal codes, amounting to an overall AAL reduction of 7% and a 100-year TVaR reduction of 3% for the entire modelled domain. The following factors contribute to the only moderate reduction of loss over the entire modelled exposure:

- Exposure is concentrated in regions which already have high protection in place against riverine flooding

- Residual risk from pluvial/off-plain flooding and from events which exceed high protection levels contributes a significant portion to overall flood risk.

At the same time, individual postal codes could be identified in both scenarios where risk reduction was substantial in absolute terms. This highlights that the cost versus benefit relationship of additional protection investments can be favourable and how modelling tools can support such analyses.

(2) Building-Level Flood Mitigation Measures

In addition to examining impacts of generalized increases to standards of protection, catastrophe models are well-suited for examining flood risk metric differences when mitigation measures are implemented in construction practices at an individual location. Some examples of mitigation measures that can be modelled at this time in available models from Verisk include "wet flood-proofing" of structural components of a building and raising or protecting service equipment (e.g. heating, electrical, or plumbing).

Using a sample exposure in the United States, consisting of 250,000 locations exposed to various levels of flood hazard and consisting of a typical exposure mix of commercial, residential and industrial locations, Verisk examined impacts by looking at differences in flood risk metrics after implementing various levels of service equipment protection and wet flood-proofing (up to 1 m).

The combined impact of wet flood-proofing and high service equipment protection (up to 1 m elevation) typically ranges from an AAL reduction for individual buildings of 6% to 15% (25% and 75% quantiles) and in the most impactful scenarios, AAL reduction of up to nearly 30% was achieved.

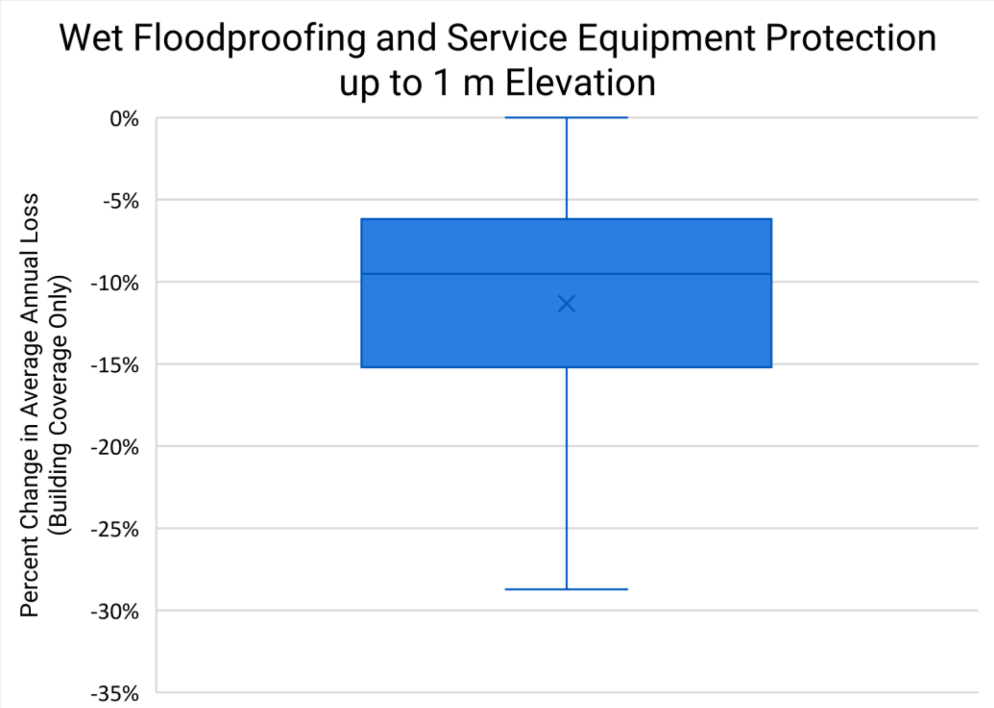


Figure: Range of building average annual loss (AAL) reduction when wet flood-proofing and service equipment protection of 1 m elevation is implemented (X indicates mean value, solid line is median).

268. The presented case studies provide the clear picture that climate-related adaptation measures can substantially reduce potential losses that could arise from climate-related hazards. However, those studies do not match the, previously described, focused scope of EIOPA's analysis on premium risk. Therefore, in order to go beyond the case studies' general conclusion and to assess the potential effect of adaptation measures on non-life underwriting risk under Solvency II, a dedicated data collection appeared necessary.

Question to stakeholders

Q68: For internal model users, is it correct that climate related adaptation measures are not explicitly taken into account in your Solvency II internal model calculations for non-life risks?

If no, please provide details on your internal models results with and without taking into consideration climate-related adaptation measures.

3.6. DATA COLLECTION

3.6.1. SCHEDULE AND SCOPE OF THE SAMPLE

269. For the intended analysis of the prudential treatment of climate-related adaptation measures in non-life insurance, EIOPA conducted a dedicated underwriting data collection in the second quarter of 2022.[82]

270. The suggested basis for the insurer sample has been the insurance undertakings that have participated on a voluntary basis in EIOPA's Pilot Exercise on Climate Change Adaptation in Non-Life Pricing and Underwriting. Each national competent authority was asked to aim at selecting at least two (re)insurance undertakings likely to be able to submit data for insurance products with and without climate-related adaptation measures. There was no restriction on the country-specific maximum number of participants. The participation of an EEA-wide sample of solo undertakings (of all legal types and sizes) was strongly encouraged to ensure that the data collected is reflecting country-specific differences in climate-related underwriting exposures.

3.6.2. DATA REQUEST

271. The data request has been similar to previous data collections regarding the calibration of the non-life premium risk parameters of the Standard Formula, but with the extension to collect information about the undertaking's implementation of climate-related adaptation measures.

272. (Re)Insurance undertakings were asked to split premium and loss data up to 10 years as requested in the data template per line of business into suitable pairs of underwriting pools: one treatment pool of insurance policies with climate-related adaptation measures and one reference pool without climate-related adaptation measures. For example regarding property insurance and flood risk: the insurance pool could be split between insurance policies with climate-related adaptation measures, e.g. buildings with water-resistant external walls, and similar insurance policies without such measures against flood risk.

273. The (re)insurance undertakings were invited to submit as many pairs of comparable underwriting pools with and without climate-related adaptation measures as possible, and to specify their data samples and adaptation measure in the relevant text field of the spreadsheet.

274. The (re)insurance undertakings were not expected to submit data if climate-related adaptation measures were not implemented in the underwriting pools or if an underwriting pool could not be split into comparable sub-pools in terms of the treatment group with adaptation measures and the reference group without adaptation measures.

275. Furthermore, if the split of suitable pairs of underwriting pools required that data from different business lines needed to be aggregated with regard to premiums and losses, then the

[82] EIOPA (2022e).

(re)insurance undertakings were strongly encouraged to provide this aggregated data and to provide corresponding information on the aggregation. This situation could emerge, for example, if the (re)insurance undertaking expected that a specific adaptation measure could have a different impact on the risks covered by an insurance policy. For example with regard to property insurance: a specific climate-related adaptation measure might have a different impact on the losses related to physical building damages and on the losses related to business interruption.

3.6.3. METHODOLOGY

276. For the purpose of assessing the potential for a new calibration of the non-life SCR parameters for premium risk in Solvency II's Standard Formula, EIOPA intends to use the Undertaking Specific Parameter (USP) methodology. The delegated act sets in its annex XVII a methodology to calibrate undertaking-specific parameters for adapting the standard formula to a specific portfolio of an undertaking, if such undertaking is authorized to use such Undertaking Specific Parameters (USP). The intended approach to measure the impact of adaptation measures on the standard deviation relates to this methodology, as described in the paragraphs B (3) to (6) of the related annex XVII. The approach requires a minimum length of annual observations of at least 5 years.

277. For each treatment underwriting pool with adaptation measure and its reference underwriting pool without adaptation measure, the standard deviation parameter for the loss ratio is estimated. When the underwriting pools with and without adaptation measures would not have the same number of years, only the most recent and overlapping years in both datasets will be kept for the analysis. The approach will lead to a series of standard deviation parameters, and a comparison between the parameters at the undertaking level and per adaptation measure will provide evidence on the potential effect of adaptation measures on premium risk. These findings will inform about the potential to amend the standard deviation parameters as listed in the Solvency II Delegated Regulation 2015/35 under Annex II.

Question to stakeholders

Q69: Do you have evidence on the impact of climate-related adaptation measures on premium risk?

Q70: Do you have comments on the proposed methodology to study the potential impact of climate-related adaptation measures on premium risk under Solvency II's Standard Formula?

4. SOCIAL OBJECTIVES AND SOCIAL RISKS FROM A PRUDENTIAL PERSPECTIVE

278. Social risks can have a material impact on human, social and economic life. If not managed properly, they can also pose material risks to the assets and liabilities of insurers.

279. As part of sustainability risks, the prudential treatment of social risks and objectives should as a starting point aim to be conceptually similar to the treatment of climate-related risks. The legislation to date, for example on the prudent person principle, makes no distinction between environmental, social or governance risks. But not all concepts and prudential measures from climate analysis may apply in a similar manner (e.g. requirements for scenario analysis or quantitative prudential reporting). Also given the stage of the public debate on the appropriate definition of social objectives and social risks, their measurement and disclosure and data availability, EIOPA intends to follow a gradual approach when assessing the potential for a dedicated prudential treatment of social risks and objectives under Solvency II. A particular aim of EIOPA's approach is to initiate discussions on the appropriate prudential consideration under Solvency II.

280. EIOPA's approach in this chapter aims to provide an initial analysis of the Pillar II and III requirements under Solvency II and to identify potential areas for further analysis. EIOPA therefore starts with identifying working definitions for social risks and objectives, and how social risks can translate into prudential risks on undertakings' balance sheets. EIOPA then sets out how insurers' governance and risk management can contribute to the identification and management of social risks, as well as to risk reduction where social objectives would be pursued by the undertaking. Moreover, the discussion paper aims to map the current disclosure requirements of social risks and objectives under current applicable regulation. This approach mirrors the conceptual pathway taken by EIOPA on the prudential treatment of climate-related risks, recognizing the double materiality principle and that the identification of the prudential risks associated with social objectives is at the core of a potential future treatment in a Pillar 1 context. Table 6 provides a brief conceptual overview of this approach in the annex.

Question to stakeholders

Q71: What do you consider to be areas where the prudential treatment of social risk and objectives should differ most from the treatment of climate risk and objectives?

4.1. SOCIAL OBJECTIVES

281. The social dimension of ESG is commonly and generally referred to as "social and employee matters, respect for human rights, and anti-corruption and bribery matters".[83] This is the definition used in the Sustainable Finance Disclosure Regulation (SFDR). The reference points for defining social factors are international standards such as the UN Global Compact (UNGC) principles, Organisation for Economic Cooperation and Development (OECD) Guidelines for Multinational Enterprises, the UN Guiding principles on business and human rights or the ILO Tripartite Declaration of principles concerning multinational enterprises and social policy.

282. The European Pillar of Social Rights, proclaimed by the European Parliament, the Council and the Commission in 2017, provides further steering on what social aspects entail through its 20 principles addressing equal opportunities and access to the labour market, fair working conditions and social protection and inclusion.[84]

283. The European Social Charter, a Council of Europe Treaty seen as the 'Social Constitution of Europe', complements the European Convention on Human Rights on social rights. These are related to employment and working conditions, housing, education, health, medical assistance and social protection.[85]

284. The Corporate Sustainability Reporting Directive (CSRD) requires companies within scope to disclose information on equal treatment and opportunities for all, including gender equality and equal pay for work of equal value, training and skills development, and employment and inclusion of people with disabilities; working conditions, including secure employment, wages, social dialogue, collective bargaining and the involvement of workers, work-life balance, and health and safety and; respect for human rights […].[86]

285. No EU 'social taxonomy' currently exists as it does for the environmental aspects; the EU Taxonomy Regulation refers to the social dimension of sustainability by defining the following key international instruments as minimum social safeguards for environmentally sustainable economic activity:[87]

- The International Bill of Human Rights (the Universal Declaration of Human Rights and the UN Covenants of Civil and Political Rights and on Economic, Social and Cultural Rights),

[83] See Regulation (EU) 2019/2088 of the European Parliament and of the Council of 27 November 2019 on sustainability-related disclosures in the financial services sector (SFDR).

[84] European Pillar of Social Rights.

[85] The European Social Charter.

[86] Approved by the Council on 28 November 2022. The final text is scheduled to be published in the Official Journal by the end of 2022.

[87] See Article 18 EU Taxonomy Regulation.

- The International Labor Organisation Declaration on Fundamental Rights and Principles at Work,
- The UN Guiding Principles on Business and Human Rights, and
- The OECD Guidelines for Multinational Enterprises

286. The Platform on Sustainable Finance has published a report with the aim of advising COM on a potential future social taxonomy (the Social Taxonomy Report).[88] The report puts forward three social objectives with a non-exhaustive list of sub-objectives and articulates the objectives by the type of stakeholder it affects (the entity's own work force (including value-chain workers); end-users/consumers; and affected communities (directly or through the value chain)). These three social objectives are:

- Decent work (wages sufficient for decent lives, eliminate forced labour and exploitation of work, eliminate child labour, no discrimination, etc.),
- Adequate living standards and well-being for end-users (ensuring healthy and safe products and services, etc.),
- Inclusive and sustainable communities and societies (improving access for target populations and/or areas to basic economic infrastructure like, transport, telecommunication including the internet, etc.)

287. The Social Taxonomy Report further identifies as examples of socially harmful economic activity the involvement with certain kinds of weapons or the production and marketing of cigarettes. The reasoning for declaring activities socially harmful could be based on two sources: (a) internationally agreed conventions, and (b) research on the detrimental social effects of certain activities to identify significantly harmful activities.

288. In the absence of an EU Taxonomy and having regard to the above-mentioned references, EIOPA considers for the purpose of the assessment of a potentially dedicated prudential treatment of social objectives, that the social objectives comprised under 'social and employee matters, respect for human rights, and anti-corruption and bribery matters' can be articulated by referring to decent work, adequate living standards and inclusive communities. EIOPA considers, as referred to in the Sustainable Finance Disclosure Regulation (SFDR), that (civil and political) human rights are also generally being considered to form part of social aspects. Matters referred to under 'anti-corruption and anti-bribery' may more likely be included in elements of 'governance'.

[88] PSF (2022b).

Question to stakeholders

Q72: Do you have comments on the working definition of social objectives, which are generally referred to as 'social and employee matters, respect for human rights, and anti-corruption and bribery matters' and can be articulated further by referring to decent work, adequate living standards and inclusive communities? Do you consider that social objectives should include anti-corruption and bribery matters, or are these governance aspects?

4.2. SOCIAL RISKS

289. For the purpose of the assessment of a potentially dedicated prudential treatment of social objectives, social risk factors need to be defined. EIOPA considers social risks as the risks that a (re)insurer faces to its assets and liabilities caused by the socially unsustainable nature of its investment and underwriting, due to the socially harmful nature of the investee or policyholder's economic activities. Social risks can impact (re)insurers' investments or underwriting activities directly or indirectly. Mirroring the working definition of the social objectives above, these risks can relate to the investee or policyholder's impact on decent work conditions, the adequacy of living standards or inclusiveness of communities.

290. Social risks can also materialize within the (re)insurance undertaking as part of operating conditions, impacting on its employees and the community. For the working definition of social risks for prudential purposes, we do not consider this latter risk.

291. Similar to climate-related risks, social risks

- are potential drivers of prudential risk on both sides of the (re)insurers' balance sheet, i.e. assets and liabilities.
- can materialize beyond the one-year solvency capital requirement time horizon as well as have sudden and immediate impact.
- can lead to potential secondary effects or indirect impacts (e.g. at macro level, the risk of unemployment can spread into health or safety risks; mitigation and adaptation action across the market to address certain social risks can lead also to secondary effects in other communities).
- translate in a (financial) impact on the (re)insurer's assets and liabilities through existing risk categories, such as underwriting, market, counterparty default or operational risk as well as reputational risk or strategic risk.[89] In other words, they are not a separate

[89] See EIOPA (2019), para 22.

risk class but ‘drivers’ to existing risk categories, which need to be integrated in the existing risk management framework.

292. The exposure of undertakings to social risks can vary across regions, sectors and lines of business, but also across communities or certain vulnerable parts of society.

293. Social risks and environmental risks (and objectives) are also potentially mutually reinforcing or their respective adverse impacts can be mitigated through preventive measures. As an example, the Council of the European Union adopted in June 2022 a recommendation on ensuring a fair transition towards climate neutrality aiming to address employment and social aspects linked to the transition.[90]

Relation between environmental and social risks

- Environmental risks can exacerbate social risks. For example, global warming may be a driving factor of migration, amplifying existing motivations for migration such as income inequality, lack of human rights or civil wars.[91] Also, expected future technological and regulatory changes regarding the transition to a decarbonized economy may have an impact on labour markets, amplify social risks, for example in certain economic sectors and communities (e.g. coal mining industry).
- Environmental objectives can support social objectives. For example, the health of society can be improved by reducing pollution.
- The (sole) pursuit of environmental objectives can also amplify social risks. For example, disinvesting from environmentally non-sustainable economic activities could have an adverse social outcome for the investees’ employees and their livelihoods if the transition is not well managed (e.g. by reskilling, training, provision of unemployment benefit schemes). Or the increased investment by large institutional investors in land for carbon capture can drive up land prices, threatening local jobs in farming.[92] Applied to insurance underwriting, if an insurer were to consider its exposure to climate change-related weather hazards only and withdraw cover from (increasingly) vulnerable areas, this could have an adverse social outcome, particularly on the more financially vulnerable by exposing them to financial (property value depreciation) or physical risk.

[90] Council Recommendation of 16 June 2022 on ensuring a fair transition towards climate neutrality 2022/C 243/04.

[91] See EIOPA (2022c) p. 30.

[92] See Financial Times, 12 March/13 March 2022, ‘Carbon capture capitalism’.

4.3. TRANSLATION OF SOCIAL RISKS INTO FINANCIAL RISKS

294. Social risks can be classified as affecting directly or indirectly (re)insurers, at macro or micro-level.

Indirect Impacts

295. Social risks can indirectly impact insurers through socio-economic developments affecting the real economy, where the impact of social risks, in their inter-play with other sustainability and financial risks, can spread across the wider economy and financial system. At macro level, the socio-economic environment can create risks to society, such as unemployment, rising price levels, health or security issues (pandemics, cyber threats), which can impact on (future) insurance business. While not all social risk-related events generate a potentially systemic impact, initial impacts on the financial system could also generate secondary effects (e.g. mortgage defaults leading to increases in mortgage insurance pay outs).

296. Being associated with socially unsustainable or harmful investees or policyholders (e.g. certain sectors which are generally perceived to violate or harm social objectives), may create a reputational risk leading to loss of confidence of (existing or potential) policyholders, resulting in loss of business for insurers at individual or at sectoral level. Underwriting risks for a socially non-sustainable (economic activity of a) policyholder (e.g. for a sector typically known for poor working conditions), can cause the (re)insurer indirect reputational risks affecting its (future) business.

Direct Impacts

297. Figure 9 illustrates how social risks can directly affect insurers' assets and liabilities through depreciation of the value of certain assets or the increase in underwriting losses due to the materialization of social risks in certain lines of business or related to certain policyholders in specific sectors (e.g. for unemployment protection or workers' compensation lines of business).

298. For assets, mirroring the social objectives identified in the Social Taxonomy Report, investing in economic activities that are typically associated with negative impacts on *'decent work'* (including for example activities associated with high work-related mental/physical illness, injuries, disabilities,), *'adequate living standards and well-being for end-users'* (including for example activities associated with high income inequality, or not providing quality products to consumers) or *'inclusive and sustainable communities and societies'* (e.g. activities associated with being non-inclusive), may lead to value depreciation of investments in those activities.

299. For insurers' liabilities, a distinction needs to be made between the (economic activity of the) policyholder and the insured risk. Where the object of the insurance coverage, i.e. the insured risk, is related to social aspects such as working conditions, the socio-economic environment as well as the economic activity of the policyholder, social risks can have a direct

impact on the insured risk. This is less the case, for example, for property insurance against fire and damage - however, insuring property against fire and damage for a policyholder with harmful social economic activity may indirectly cause reputational risk.

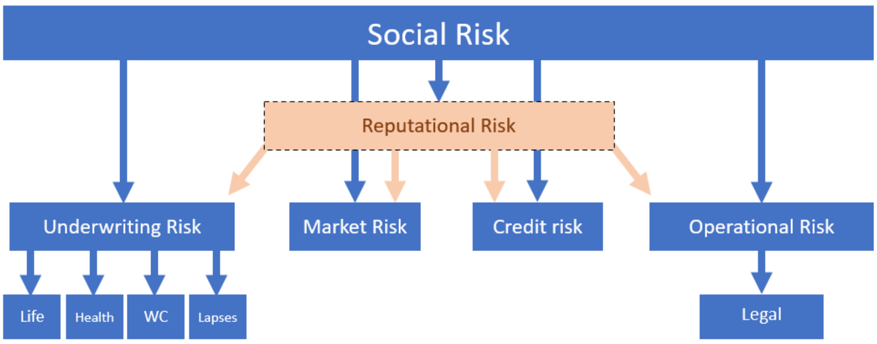
a) The (re)insurer may suffer direct underwriting risk - an increase in losses - in a certain line of business caused by social risks materializing at the policyholder, irrespective of the underlying economic activity.

b) Lines of business covering risks related to, for example, working conditions and related health issues, in sectors at high risk of negatively impacting social objectives related to decent work ('high risk sectors') may face high direct underwriting risk.[93]

c) Regarding health insurance, socio-economic developments or general lifestyle and consumption habits, which translate into higher morbidity, mortality or hospitalization underwriting costs, can also be identified as social risks attached to the policyholder and to his/her living conditions. The PSI ESG Underwriting Guide for Life and Health Insurance categorizes, among others, health capabilities (regular health checks, screening, vaccination) or lifestyle behavior (alcohol/drug abuse, smoking, hazardous sports, obesity) as social factors impacting - directly - on the potential underwriting losses.[94]

300. In addition, the failure to mitigate, adapt or disclose social risks may create not only (indirect) reputational risks but also direct operational risks, i.e. legal risk for the (re)insurer, considering it may be held liable because of requirements for due diligence and reporting on sustainability matters.

Figure 9: Social Risk Mapping



Source: Own Figure.

[93] The Social Taxonomy Report provides examples of high-risk sectors related to decent work: sectors with high prevalence of contingent workers and/or workers earning the minimum wage; sectors with skills shortages; sectors with high occupational health and safety incidents according to, e.g. ILO statistics. Such sectors can include mining and quarrying, construction, transportation.

[94] PSI (2022).

301. Examples of the translation of social risk into the Solvency II risk categories on assets and liabilities are given in Table 4.

Table 4: Social Risks and Prudential Risks

	Social risk translating into asset or liability risk
Underwriting risk **(life, health, and non-life)**	• Health and life insurance: losses arising under workers' compensation or other employee indemnification benefits coverage at workplaces with high incidence of occupational health and safety accidents • Health and life insurance: increased mortality, morbidity or hospitalization cost caused by socio-economic developments, lifestyle behavior • D&O liability insurance: increased losses arising from 'social injustice' actions brought against corporate boards[95] • Increase in lapses, due to, for example negative sentiment towards the insurance undertaking's policy on underwriting certain 'high risk' sectors • Increase in expenses due to increase in lapses or lower insurance subscriptions because of the socio-economic impact of social risks (unemployment) • Credit insurance: counterparty default increasing because of socio-economic developments (inflation, increased cost of living, unemployment, etc.)
Market risk	• Asset price volatility / stranded assets due to, for example, investment in 'high risk sectors' where investee's reputational risk materializes in lower market value; equity or corporate bonds in economic activity damaging health, or housing, or sovereign bonds of states violating human rights
Operational Risk (incl. legal risk)	• Losses arising from inadequate or failed internal processes, personnel or systems to identify social risks: for example, insurers' systems/staff not being able to act on previous signals on social risks in their investments /underwriting and not able to manage social risk

Source: Own Table.

[95] For example, lawsuits concerning the violation of legal duties regarding diversity on corporate boards. This can be considered as a social risk against the objective of achieving inclusive and sustainable communities and societies, and may be enforceable under certain (sectoral, national or European) regulation. For example, CRD IV requires Member States to ensure diversity in the composition of management bodies of credit institutions, and the setting of a target to ensure representation of the underrepresented gender (Art. 88). In the United States, Assembly Bill 979 specifies targets for board membership from underrepresented communities of companies headquartered in California.

Questions to stakeholders

Q73: Do you have comments on the mapping of social risks into prudential risks?

Q74: Do you have additional examples of how social risks can translate into the Solvency II risk categories?

4.4. THE PRUDENTIAL TREATMENT OF SOCIAL RISKS

302. There is evidence regarding economic activities which can out- or underperform by pursuing or violating certain social objectives. For example, affirmative action on social objectives, for improving working conditions for the entity's own work force, value-chain workers, as well as end-users/consumers and affected communities (directly or through the value chain) can lead to increased ability to recruit, retain workers, strengthening competitive advantage, or even brand value. Observations have been made of the stock price of companies associated with high social sustainability credentials to have outperformed those with poor social sustainability profiles in the initial months of the Covid-19 pandemic, e.g. by protecting employees against unemployment (avoiding lay-offs, paying sick leave), managing supply chain risk to avoid disruptions in production or re-purposing operations to provide solutions.[96] Other reported cases include examples of firms that treat their workforce poorly and suffer negative consequences, including weaker access to human capital and decreased trust and innovation. Conflict with local communities can result in lost opportunities for future projects, expansions, or sales.[97]

303. However, EIOPA decided to apply a gradual approach in assessing the potential prudential treatment for social risks and objectives. EIOPA has decided not to analyze a prudential Pillar 1-related capital treatment for social risks. Consistent with the first steps taken on climate-related risks in 2019, EIOPA has decided at this stage to address the prudential treatment of social risks from a 'Pillar II and III' perspective, focusing on governance and risk management as well as reporting and disclosure requirements.

304. The basis for the prudential treatment of social risks is the Solvency II Delegated Regulation, which requires the integration of sustainability risks, incl. environmental, social and governance risks into the (re)insurers' governance and risk management.[98] At the same time, the Delegated Regulation requires (re)insurers to take into account the longer term impact of their investment

[96] See Blackrock (2020). The analysis also noted the incipient shift in preferences for sustainable investment has been accelerated by the crisis.

[97] O'Connor and Labowitz (2017).

[98] Commission Delegated Regulation (EU) 2021/1256 of 21 April 2021 amending Delegated Regulation (EU) 2015/35.

strategy and decisions on sustainability factors, as part of the prudent person investment principle, reflecting the notion of double materiality (Art. 275(a)).

4.4.1. GOVERNANCE AND RISK MANAGEMENT OF SOCIAL RISKS

305. The Solvency II Delegated Regulation integrates sustainability risks, i.e. environmental, social and governance risks into the (re)insurers' governance and risk management, through the following requirements:

- Insurers' investment and underwriting policies shall refer to actions taken to assess and manage the risk of loss resulting from inadequate pricing and provisioning assumptions due to sustainability risks, and to actions taken to ensure sustainability risk relating to the investment portfolio are properly identified, assessed and managed (Art. 260).
- The risk management function shall identify and assess sustainability risks, and this shall form part of the (re)insurers own risk and solvency assessment (ORSA) (Art. 269).
- The actuarial function shall consider sustainability risks in its activities (Art. 272(6)).
- The remuneration policy shall include information on how it considers the integration of sustainability risks in the risk management system (Art. 275 (4)).
- As part of the prudent person principle on investment strategy and decisions (Art. 275a):
  - When identifying, measuring, monitoring, managing, controlling, reporting and assessing risks from investments, (re)insurance undertakings shall take into account sustainability risks.
  - (Re)insurance undertakings shall take into account the potential long-term impact of their investment strategy and decisions on sustainability factors.
  - Where relevant, the investment strategy and decisions shall reflect the sustainability preferences of the insurer's customers taken into account in the product approval process.

306. As a result, (re)insurers shall ensure that social risks in their underwriting and investment activities are properly assessed and managed as part of their governance and risk management, including as part of their ORSA.

307. Supervisory experience shows that social risks, if considered at all, has so far been assessed in a predominantly qualitative manner. Social risks are addressed mostly as part of a (re)insurer 'corporate social responsibility', rather than as a prudential risk driver. Where some (re)insurers undertook an analysis, their ORSAs make little distinction between different types of social risk or their differentiated impact on investments or liabilities. (Re)insurers who referred to social risks in their ORSA, noted that social risk would mainly translate into financial risks through reputational risk.

308. The ORSA is a good starting point for undertakings to investigate on their potential exposure to social risks. Where social risks are considered material for a (re)insurer, an analysis in a qualitative and/or quantitative manner should take place and further measures should then be taken as part of the (re)insurer's risk management measures.

Potential elements for integrating social risk analysis in the ORSA

Undertakings can consider the following questions as part of their initial assessment of social risks in the ORSA:

- Vision and strategy: how does the undertaking aim to develop and strengthen its business having a forward-looking approach to social risks in society, the undertaking's activities and lines of business?
- Risk appetite and risk profile: based on the potential strategy, how does the undertaking identify social risks when setting its risk appetite and risk profile for investments and underwriting?
- Risk assessment: how does the undertaking see social risk potentially translating into financial risk, and what is the potential magnitude of investment or underwriting losses?
- Scenario analysis: what is, on a best effort basis, the potential effect of policy and socio-economic factors as well as mutually reinforcing or mitigating effects of social and other (e.g. environmental) aspects?
- Management actions: what possible mitigating actions can be considered to reduce the eventuality or impact of social risks on the undertaking's assets or liabilities?

4.4.2. RISK MITIGATION AND ADAPTATION MEASURES TO ADDRESS SOCIAL RISKS

309. As part of the prudent person principle, (re)insurance undertakings shall take into account the potential long-term impact of their investment strategy and decisions on sustainability factors (Solvency II Delegated Regulation, Art. 275a). This reflects the reasoning that misalignment of the investment strategy with social objectives may cause prudential risks.

310. Consistent with mitigation and adaptation measures which insurers can take in addressing climate-related or environmental risks, undertakings can decide to limit their exposure to socially non-sustainable activities or promote adaptation measures as part of their investment or underwriting strategy and decisions.

311. Unlike for the investment strategy, no prudential requirements currently exist in the Solvency II Delegated Regulation requiring (re)insures to take into account the potential long-term impact of their underwriting strategy and decisions on sustainability factors.

312. The management of risks for society can be considered inherently social, as it contributes to societal resilience by decreasing vulnerability to certain risks such as unemployment or damage to property. The lack of available or affordable insurance coverage (so-called insurance

protection gaps) can indeed potentially be detrimental to citizens' living standards and well-being. This does not in itself make insurance underwriting activity socially sustainable, however. Nor does it imply that insurance should pursue social objectives in their underwriting.

313. Undertakings can opt to pursue measures in their underwriting activity that could contribute to social risk mitigation or adaptation. For example, there may be scope for insurers, through their underwriting strategy and decisions, to incentivize policyholders to manage losses arising from social risks, consistent with actuarial risk-based principles. This may be through the provision of services, such as health monitoring and advice as part of health and life underwriting, or the potential reduction of premia for risk reducing measures taken by the policyholder.

314. Mirroring EIOPA's work on underwriting and pricing of non-life insurance in light of climate change,[99] there may be scope for further analysis for the prudential treatment of adaptation or mitigation practices to address social risks as part of the underwriting and pricing strategy of (re)insurers.

Practices for taking into account social factors in the investment strategy and decisions

<u>Limiting investment in socially non-sustainable activities/companies ('mitigation strategies)'</u>

The exclusion of an investee harming social objectives is the most radical approach. The identification of socially harmful activities can be based on two sources: internationally agreed conventions (for example, certain kinds of weapons) or research on the detrimental effects of certain activities (e.g. detrimental effect of tobacco use). Thresholds for investments in such companies can be set, or exclusions from investments in these sectors pursued. Minimum social safeguards (see above) can serve as a guiding principle.

<u>Impact investing and stewardship and ('adaptation strategies')</u>

An inclusion (impact) investment strategy would direct investments at economic activities aiming to achieve explicitly social goals. For example, the funding of health research, through targeted investments in dedicated undertakings or investment in financial literacy programs may contribute to social objectives to improve living standards or access to relevant products to secure financial safety.

Engagement and voting on sustainability matters (as part of a stewardship approach) can also be a way to influence undertakings of which (re)insurers are shareholders. This supposes the undertaking has the ability to persuade the investee to take action and a certain degree of influence or leverage that the company can reasonably exercise. Insurers can use their

[99] EIOPA (2021a).

engagement and voting rights to initiate change in the companies that they invest in to improve performance of those companies against the social objectives.

A 'best-in-class strategy' would consist in selecting investment in companies engaging in explicit social objectives, regardless of the sector which they belong to. Such an investment approach can support companies to transition to a more socially sustainable business model. (Re)insurers can seek to ensure that those firms they invest in measure up to social objectives, especially in 'high risk sectors, ensuring, for example that they provide appropriate wages, or that they operate safe working environments.[100]

Practices for considering social factors in the underwriting strategy and decisions

Limiting underwriting of socially non-sustainable activities ('mitigation strategies')

Similar to investments, insurers could opt for not insuring companies (belonging to a sector) known for unsustainable or harmful social practices.

Impact underwriting and services ('adaptation / mitigation strategies')[101]

Through targeted underwriting activity, products and services, insurers could bring additional social benefits that directly contribute to the realization of social objectives for end-users and consumers as well as for affected communities (directly or through the value chain). For example:

- As a risk mitigating or adaptation measure of social risk, insurers can target specific types of products to vulnerable parts of society or specific sectors (e.g. through micro-insurance, expanding health, life and livelihood insurance coverage in developing markets to reduce the risk that children are absent from school due to untreated medical conditions, or that they are withdrawn from school to care for a sick relative or to undertake livelihood activities to supplement household income). The integration of social risk mitigants into, for example, surety bond underwriting for infrastructure projects can also contribute to reducing losses from underwriting due to social risks. Leveraging technological innovation can create more efficient and effective operating and distribution models for insurance, reducing social risks by extending financial inclusion. For example, products with reduced payout timescales and improved support can increase resilience to secondary shocks (e.g. financial duress after a

[100] The PSF report on Social Taxonomy proposes, mirroring the environmental taxonomy, a sector classification, based on the NACE industrial classification system, which would classify sectors according to their 'substantial contribution' to social objectives – either by addressing and avoiding negative impacts or enhancing positive impacts. High risk sectors related to decent work could, for example, include sectors with prevalence of contingent workers (seasonal) or sectors with skill shortages, or with high incidence of occupational health and safety accidents.

[101] UN Global Compact (2015).

natural catastrophe or other risks) and further reduce underwriting or reputational risks. The establishment of sectoral risk sharing capacities at local, regional or national level, where applicable with government involvement, can contribute to social risk mitigation, for example by improving risk assessment for communities and societies and reducing losses from socio-economic risk events.

- Insurance can reduce social risks and contribute to adequate living standards and well-being for end-users, for example through health insurance products that support health and well-being through education and prevention or promote incentives for healthy living standards, in a risk-based manner.

4.4.3. THE ROLE OF CORPORATE GOVERNANCE IN IDENTIFYING AND MANAGING SUSTAINABILITY RISKS

315. The (prudential) identification and management of sustainability risks can be supported by the (re)insurer's corporate governance structure. The consideration of sustainability factors in management structures, employee relations and executive remuneration can contribute to the inclusion of sustainability considerations in the undertaking's decision making process.[102] Applied to social aspects, an appropriate corporate governance framework which sets guidelines and incentives for behavior benefitting the company's own social performance (e.g. the undertaking's employee satisfaction, safety and well-being) could also provide a minimum safeguard for ensuring management's awareness for social risks and opportunities in its investment and underwriting activity. Corporate governance tools that can support awareness for social risks and contribute to social objectives, within the undertaking, and in its investment and underwriting activity can be:

- Remuneration strategy: e.g. by balancing the gender pay gap and CEO pay ratios in its own remuneration practices, the undertaking expresses/may become more aware of social equality in its core activities
- Board composition: e.g. by considering diversity in the composition of the AMSB or appointment of key functions, the undertaking expresses/may become more aware of social inclusiveness in its core activities
- Anti-corruption & anti-bribery policies or measures for workplace accident prevention and safety policies: e.g. by ensuring whistle blower protection or measures for health and accident prevention, the undertaking expresses/may become more aware of conditions for decent work in its core activities.

[102] EC (2022b).

Questions to stakeholders

Q75: Do you have comments on the proposal to start by integrating the treatment of social risks as part of Pillar II and III of Solvency II, covering governance, risk management and reporting/disclosure requirements?

Q76: What do you consider good practices for addressing social risks as part of the ORSA?

Q77: Do you think that particular guidance would be helpful for addressing social risks as part of the ORSA?

Q78: What type of risk management actions are most relevant to address social risks?

Q79: How do social risks typically impact on business planning (3-5 years) or long-term strategy?

Q80: The taxonomy regulation includes key international standards on social issues as minimum safeguards (Article 18) in order to prevent environmentally sustainable activities from harming fundamental human rights, workers' rights or principles of good governance (such as anti-bribery measures, for example). Would you agree that such minimum social safeguards could be used as guiding principles for implementing the prudent person principle requirement for investments with regards to social factors?

Q81: Similarly to EIOPA's ongoing analysis on the integration of climate change adaptation into underwriting practices, do you see value in conducting further analysis on how insurers, through their underwriting activity, can include mitigation and adaptation measures for social risks in their underwriting strategy in an actuarial risk-based manner?

Q82: What are your views on the potential role of - and potential prudential relevance of - corporate governance aspects, such as remuneration, board composition or ant-corruption & anti-bribery tools to reduce potential social risks?

4.4.4. REPORTING AND DISCLOSURE OF SOCIAL RISKS AND FACTORS

316. Various initiatives on sustainability reporting and disclosure are underway at European and international level.

317. The International Sustainability Standards Board, created by the International Financial Reporting Standards (IFRS) Foundation to advise on sustainability disclosure standards at international level, consulted in 2022 on two draft standards - on general sustainability-related disclosures and climate disclosures so far.

318. At European level, the Non-Financial Reporting Directive (NFRD), together with the Sustainable Finance Disclosure Regulation (SFDR) and the Taxonomy Regulation, are the central components of the sustainability reporting requirements underpinning the EU's sustainable

finance strategy. The Corporate Sustainability Reporting Directive (CSRD) builds on and revises the sustainability reporting requirements set out in the NFRD, in order to make sustainability reporting requirements more consistent with the broader sustainable finance legal framework, including the SFDR and the Taxonomy Regulation, and to tie in with the objectives of the European Green Deal.

319. The Taxonomy Regulation requires insurers to report key performance indicators related to environmentally sustainable activities, and the Taxonomy Delegated Act specifies the requirements for climate change mitigation and adaptation, but no requirements are applicable yet for activities related to social objectives.

320. Within the context of the CSRD and under the mandate given by the Commission, the European Financial Reporting Advisory Group (EFRAG) has submitted its technical advice to the European Commission on a first set of European Sustainability Reporting Standards (ESRS), which the Commission is empowered to adopt via Delegated Acts.[103] While the environmental standards were extensive and detailed with five exposure drafts (climate change, pollution, water and marine resources, biodiversity and ecosystems, resource use and circular economy), so are the social standards with a series of disclosure requirements divided in four standards addressing companies' social impacts on its own workforce, workers in the value chain, affected communities, consumers and end-users. One standard address business conduct.

321. Moreover, insurers within the scope of the Sustainable Finance Disclosure Regulation (SFDR) are required to disclose principal adverse impacts of their investments on social factors (in addition to doing so for environmental factors) by reporting on a series of social indicators, mandatory and opt-in. Among the mandatory indicators, insurers have to report on the share of investments in companies in violation of the UNGC or OECD MNE guidelines as well as on investee companies' board gender diversity, average gender pay gap and investments' exposure to controversial weapons. Among the opt-in indicators, insurers will be able to report on various other social aspects such as investee companies' rate of accidents, insufficient whistle-blower protection, incidents of discrimination, lack of human rights policies, child labor, and lack of anti-corruption policies. In the context of a mandate received by the Commission in April 2022, the ESAs are currently reviewing and enhancing the indicators for principal adverse impact.[104]

322. EIOPA is not proposing at this stage to develop additional prudential reporting or disclosure requirements regarding social risks and factors. Further analysis would in addition be required as to whether quantitative prudential reporting requirements would be relevant.

323. The Annex contains a more detailed overview about the current EU regulatory framework for sustainability reporting requirements.

[103] EFRAG submitted its technical advice to the European Commission on 23 November 2022, see: First Set of draft ESRS - EFRAG.

[104] EIOPA (2022g).

5. NEXT STEPS

324. EIOPA's analysis on the extent to which a dedicated prudential treatment of environmental or social objectives under Solvency II would be justified is motivated by the proposed Article 304a of the Solvency II Directive, which is still under discussion. The scope and timeline of the proposal will only be known at a later date.

325. EIOPA is following a step-by-step approach regarding its anticipated mandate, starting by a discussion paper focusing on methodologies and data sources for the analysis.

326. Comments on the discussion paper can be made until 5 March 2023. EIOPA will consider the feedback received on the discussion paper to develop further the proposed methodologies for the analysis intended.

6. ANNEXES

6.1. CLIMATE-RELATED ADAPTATION MEASURES

Table 5: Classification of climate-related hazards

	Temperature-related	Wind-related	Water-related	Solid mass-related
Chronic	Changing temperature (air, freshwater, marine water)	Changing wind patterns	Changing precipitation patterns and types (rain, hail, snow/ice)	Coastal erosion
	Temperature variability		Precipitation or hydrological variability	Soil degradation
	Heat stress			Soil erosion
			Ocean acidification	
	Permafrost thawing			Solifluction
			Saline intrusion	
			Sea level rise	
			Water stress	
Acute	Heat wave	Cyclone, hurricane, typhoon	Drought	Avalanche
	Cold wave/frost	Storm (including blizzards, dust and sandstorms)	Heavy precipitation (rain, hail, snow/ice)	Landslide
	Wildfire	Tornado	Flood (coastal, fluvial, pluvial, ground water)	Subsidence
			Glacial lake outburst	

Source: Annex A of the EU Taxonomy Climate Delegated Act supplementing Regulation (EU) 2020/852.

6.2. CLIMATE AND SOCIAL RISK OBJECTIVES

Table 6: Comparison of Conceptual Approaches

Summary overview of impacts and prudential treatment from a double materiality perspective (outside-in and inside-out)		
	Climate	**Social**
Risks: Financial impact ('outside-in')	**Transition Risks**: Financial losses in assets and liabilities due to the (mis)-alignment with commonly agreed objectives (e.g. for climate: Paris 1.5 Degrees Celsius Agreement) and (sectoral) target reductions of e.g. GHG emissions.	**Transition Risks**: Financial losses in assets and liabilities due to the (mis)-alignment with high level social objectives (e.g. International Bill of Human Rights, ILO Declaration on Fundamental Rights and Principles at Work, UN Guiding Principles on Business and Human Rights and OECD Guidelines for Multinational Enterprises).
	Physical Risks: Financial losses in assets and liabilities due to temperature-, wind-, water and solid mass-related hazards (e.g causing damage to property).	**Physical Risks**: Possible analogue to physical risks in climate: financial losses in assets and liabilities due to work- or living standards related hazards (e.g. absence of work place safety standards causing mortality or disability).
	Other: reputational risk. Financial losses in assets and liabilities resulting from climate-related externalities of the sector of the investee or policyholder, or the undertaking's own performance.	**Other:** reputational risk. Financial losses in assets and liabilities resulting from social-related externalities of the sector of the investee or policyholder, or the undertaking's own performance.
Risks: Prudential treatment	**Pillar 1:** Climate-related risks are not explicitly treated under the solvency capital requirements. The discussion paper sets out the proposed methodology to assess the potential for a dedicated prudential treatment for assets and liabilities. The discussion paper also sets out analysis by EIOPA on the prudential treatment of adaptation measures to address climate-related risks as part of the underwriting and pricing strategy.	**Pillar 1:** Social risks are not explicitly treated under the solvency capital requirements. There is no assessment yet of a dedicated prudential treatment. EIOPA intends to follow a gradual approach in assessing the potential for a dedicated prudential treatment of social risks and objectives, addressing in a first stage through Pillar II and III requirements. At a later date, and mirroring EIOPA's work on impact underwriting, there may be scope for further analysis for the potential prudential treatment of adaptation or mitigation practices to address social risks as part of the underwriting and pricing strategy.
	Pillar 2: Climate risks are part of the governance and risk management requirements, including ORSA. EIOPA Opinion requires 2-type scenario analysis on material climate change risks, with application guidance.	**Pillar 2**: Social risks are part of the governance and risk management requirements, including ORSA. Any potential scenario analysis on social risks may differ from climate risk scenario analysis (e.g. potential qualitative nature).
	Pillar 3:	
	Disclosure under Taxonomy Regulation of key performance indicators related to environmentally sustainable activities, specified by the Taxonomy Delegated Regulation for climate adaptation and mitigation.	Taxonomy-related disclosure on social performance limited to minimum social safeguards attached to environmental objectives.
	Disclosure under proposal for the Corporate Sustainable Reporting Directive (CSRD) on environmental and social standards. Disclosure of principal adverse impacts of investments on environmental and social factors under the Sustainable Finance Disclosure Regulation (SFDR). EIOPA proposal to EU Commission on prudential public disclosure on sustainability risks.	

	EIOPA proposal to EU Commission for prudential supervisory quantitative reporting on climate-related risks to investments.	Further analysis would be required as to whether quantitative prudential reporting requirements would be relevant. There is no proposal for quantitative prudential reporting requirements on social aspects today.
Objectives: Climate and Social Impact ('inside-out')	Mitigation or adaptation strategies (ranging from exclusions of certain assets or underwriting risks, to stewardship approaches and impact investing and underwriting) to reduce impact on sustainability factors or to support sustainability objectives, through investments and underwriting activity. Such strategies may differ in scope and target setting for climate and social objectives, for example due to differences in agreed (industry) standards, or the application of national legislation.	
Objectives: Prudential Treatment	Prudent Person Principle under Solvency II requires undertakings to take the impact of investments on sustainability factors into account.	

Source: Own Table.

6.3. MANDATORY PRINCIPAL ADVERSE SOCIAL IMPACT INDICATORS UNDER THE SFDR

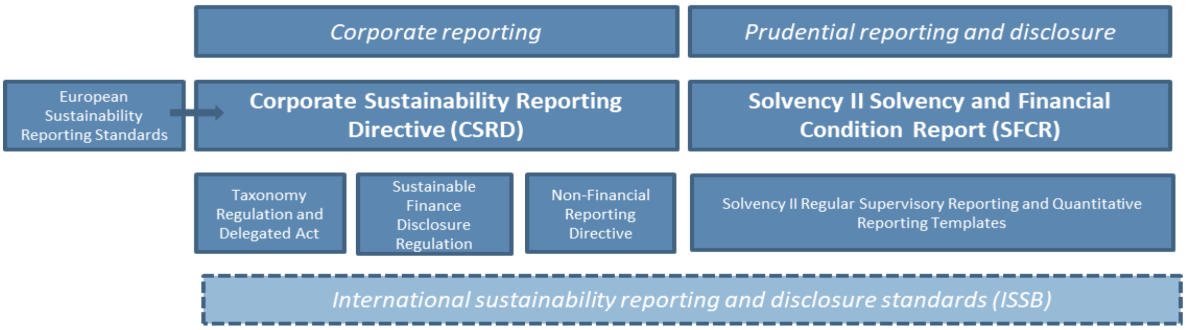
Table 7: SFDR mandatory principal adverse social impact indicators

	Indicator	**Metric**
Applicable to investments in investee companies	Violations of UN Global Compact (UNGC) principles and Organisation for Economic Cooperation and Development (OECD) Guidelines for Multinational Enterprises	Share of investments in investee companies that have been involved in violations of the UNCG principles or OECD Guidelines for Multinational Enterprises
	Lack of processes and compliance mechanisms to monitor compliance with UN Global Compact principles and OECD Guidelines for Multinational Enterprises	Share of investments in investee companies without policies to monitor compliance with the UNGC principles or OECD Guidelines for Multinational Enterprises or grievance/complaints handling mechanisms to address violations of the UNGC principles or OECD Guidelines for Multinational Enterprises
	Unadjusted gender pay gap	Average unadjusted gender pay gap of investee companies
	Board gender diversity	Average ratio of female to male board members in investee companies
	Exposure to controversial weapons (anti-personnel mines, cluster munitions, chemical weapons and biological weapons)	Share of investments in investee companies involved in the manufacture or selling of controversial weapons
Applicable to investments in sovereigns and supra-nationals	Investee countries subject to social violations	Number of investee countries subject to social violations (absolute number and relative number divided by all investee countries), as referred to in international treaties and conventions, United Nations principles and, where applicable, national law

Source: Own Table.

6.4. OVERVIEW OF REPORTING AND DISCLOSURE REQUIREMENTS ADDRESSING SOCIAL RISKS AND OBJECTIVES

Figure 10: Overview of Reporting and Disclosure Requirements



Source: Own Figure.

Table 8: Current state of play on (proposals) for social sustainability reporting and disclosure requirements applicable to (re)insurers in EU

Non-financial Reporting	The Non-Financial Reporting Directive (NFRD) currently requires certain large companies - including (re)insurers - to disclose information on the way they operate and manage social challenges, including the undertaking's development, performance, position and impact of its activity, relating to, as a minimum, social and employee matters, diversity on company boards, respect for human rights, anti-corruption and bribery matters.[105]
Taxonomy reporting	The Taxonomy Regulation sets up a classification system for environmentally sustainable economic activities and imposes reporting requirements for financial market participants', incl. (re)insurers within the scope of the NFRD, about the extent to which their activities are environmentally sustainable according to the Taxonomy. The regulation is in force since July 2020, and is being implemented by the Delegated Regulation on the disclosure of environmentally sustainable

[105] Directive 2014/95/EU of the European Parliament and of the Council of 22 October 2014 amending Directive 2013/34/EU.

	economic activities (in force since Jan. 2022) and the Sustainable Finance Disclosure Regulation (in force since 10 March 2021)). ➢ In the absence of a 'social taxonomy', no reporting requirements exist on activities' compliance with a social taxonomy. ➢ The Taxonomy regulation requires however environmentally sustainable activities to comply with minimum social safeguards (Article 18) in order to prevent them from harming fundamental human rights, workers' rights or principles of good governance (such as anti-bribery measures, for example).
Disclosure of sustainability information	The Sustainable Finance Disclosure Regulation governs how financial market participants, including (re)insurers should disclose sustainability, incl. social, information to end-investors and asset owners, at entity and product level.[106] This includes at entity level, information on sustainability risk policies, adverse sustainability impacts of investment decisions on sustainability factors, information on remuneration policies in relation to the integration of sustainability risks, and on the integration of sustainability risks in investment decisions and impact of sustainability risks on returns of financial products. It requires, at product level, the disclosure of sustainability characteristics or objectives of financial products. ➢ To date, the SFDR Delegated Regulation requires the disclosure of six mandatory principal adverse impact indicators related to social factors, covering violations of the UN Global Compact (UNGC) principles or the OECD guidelines for multinational enterprises (MNE), gender pay gap, board gender diversity, and exposure to controversial weapons. ➢ Additional/opt-in indicators are included in the delegated regulation ➢ The ESAs have been mandated by COM to further develop principal adverse impact indicators, including on social impacts, by Spring 2023.[107]

[106] EC (2022c).

[107] EIOPA (2022g).

Corporate sustainability reporting	The Corporate Sustainability Reporting Directive (CSRD) amends the existing reporting requirements under the NFRD.[108] The CSRD broadens the scope of the NFRD sustainability, incl. social, reporting requirements, specifies in greater detail the information that companies should disclose, that companies should report qualitative and quantitative information, forward-looking and retrospective information, and information that covers short, medium and long-term time horizons as appropriate. It aims to clarify the principle of double materiality, removing any ambiguity about the fact that companies should report information necessary to understand how sustainability matters affect them, and information necessary to understand the impact they have on people and the environment. It also aims to ensure that the corporate reporting requirements are consistent with the EU taxonomy, and aims to ensure that investee companies report the information financial market participants need to fulfil the SFDR reporting requirements.
Prudential supervisory reporting (QRT and RSR)	EIOPA has advised COM to integrate in the quantitative reporting requirements, the reporting on climate-change related risk to investments.[109] ➢ EIOPA has not advised COM yet to amend the Solvency II requirements for reporting on social risks in the quantitative reporting (incl. quantitative reporting templates, SRT) or supervisory reporting (Regular Supervisory Report, RSR).
Prudential disclosure (SFCR)	As part of its advice to COM on the Solvency II review, EIOPA proposed to include public disclosure requirements on sustainability risks, i.e. including social risks in the Solvency II Delegated Regulation as part of the Solvency and Financial Condition Report ('SFCR', proposed amendments underlined). These proposals are being part of the ongoing negotiations on the Solvency II review.[110] ➢ **Article 293 - Business and performance**

[108] Approved by the Council on 28 November 2022. The final text is scheduled to be published in the Official Journal by the end of 2022.

[109] EIOPA (2022f).

[110] EIOPA (2020b), Annex 7.2 – SFCR content proposal for the Delegated Regulation, as part of disclosure to 'other users'.

	2a. The solvency and financial condition report shall include qualitative and quantitative information regarding the consideration of Environmental, Social, and Governance factors in the underwriting policy of the insurance or reinsurance undertaking, and any activities related to the development of products and services which reduce sustainability risks and have a positive impact on environmental, social, and governance issues. 3. The solvency and financial condition report shall include all of the following qualitative and quantitative information regarding the performance of the investments […]; (d) information on the investment policy, including qualitative and quantitative information regarding the consideration of environmental, social, and governance factors in the investment policy of the undertaking and any stewardship activities related to the investees on account of Environmental, Social, and Governance issues. ➢ **Article 294 - System of governance** The solvency and financial condition report shall include all of the following information regarding the system of governance of the insurance or reinsurance undertaking: […]; (b) (i) principles of the remuneration policy, with an explanation of at least the relative importance of the fixed and variable components of remuneration and deferral of variable component and how the remuneration policy is consistent with the integration of sustainability risks. ➢ **Article 296 - Valuation for solvency purposes** 1. The solvency and financial condition report shall include separately for each material class of assets, following the classification as set out in the solvency balance sheet, the value of the assets, as well as a description of the bases, methods and main assumptions used for valuation for solvency purposes, including, where relevant, the consideration of sustainability risks and factors in the valuation methods. 3. Idem for technical provision ➢ **Article 297 - Capital management and risk profile (ORSA)** […] 9. The solvency and financial condition report shall include information on how the undertaking has determined its own solvency needs given its risk profile, including the effect of sustainability risks, and how its capital management activities and its risk management system interact with each other.

Source: Own Table.

6.5. OVERVIEW OF QUESTIONS

Q1: Are there any specific data sources that might be useful for a historical analysis of transition risk for private and public equity and debt? How can EIOPA access them? Why are they relevant?

Q2: In case you are suggesting the use of historical "non-valuation data" like cash flows: How would the measurement of risk be commensurate with the definition under Solvency II (i.e. fluctuation of values in accordance with Article 75)?

Q3: Do you have comments on the outlined criteria for the selection of market indices?

Q4: Are there any equity indices not mentioned above that would be relevant to analyze? Why?

Q5: Are there any equity indices which focus on companies with higher transition risk?

Q6: Would you have any suggestions how the effect of different levels of transition risk could be "isolated" when comparing the historical risk for a given index with the broad market?

Q7: Are there any other bond indices suitable for the analysis? Why?

Q8: Are you aware of any indices which focus on companies with higher transition risk?

Q9: Would you have any suggestions how the effect of different levels of transition risk could be "isolated" when comparing the historical risk for a given index with the broad market?

Q10: Would you have any suggestions how to compare the risk of a given bond price index (i.e. no separate spread data for each rating class and maturity buckets available) with a "conventional" bond index taking into account possible differences in ratings and durations?

Q11: Do you see any other possible approach to classify stocks and bonds according to their transition risk exposure? What would be their advantages?

Q12: Would you have other ideas how to quantify transition risk per NACE code?

Q13: Would you have suggestions for sector definitions other than by NACE code? What are their advantages? How does one quantify their transition risk?

Q14: Do you agree that either the debt or equity shocks from recent stress test exercises should be used for measuring transition risk (resulting in one measure for both asset classes)? What advantages do you see in using equity or debt shocks respectively?

Q15: Do you have any comments on the company-specific transition risk measures set out in this chapter? Are there other ones? If so, what are their advantages?

Q16: Do you agree with focusing on greenhouse gas (GHG) emission intensities rather than on absolute GHG emissions? What is your view regarding the scope of emissions to be used (1, 2 or 3)?

Q17: Do you see other approaches to define portfolios with companies subject to higher, medium and lower transition risk exposure based on their NACE codes? What are the advantages?

Q18: Do you consider it preferable to combine the CPRS classification (Battiston et al. (2017)) with the use of asset shocks (e.g. DNB stress test) to differentiate assets according to their transition risk exposure or should only the latter be used? Why?

Q19: If debt or equity stress test factors are used (e.g. DNB stress test), how should the thresholds to separate lower, medium and higher transition risk exposures be set?

Q20: Do you have any comments how to test the robustness of the sectoral classifications into higher, medium and lower transition risk exposure?

Q21: Would you have any suggestions how to derive a less granular definition of the higher transition risk sectors (e.g. based on 2nd digit NACE codes) based on the CPRS classification (Battiston et al. (2017)) in line with the granularity of the stress test exercises while preserving the risk sensitivity?

Q22: What is your view on the treatment of financial institutions regarding transition risk?

Q23: Would you have any suggestions for other portfolios that should be analysed (perhaps also portfolios with lower transition risk)? Why are these portfolios relevant?

Q24: What is the minimum number of bonds/equities in a portfolio that ensures results are reliable?

Q25: Do you see other approaches to define portfolios with companies subject to higher, medium and lower transition risk based on the company-specific approach? What are their advantages?

Q26: How should the thresholds to separate lower, medium and higher transition risk sectors be chosen?

Q27: Do you have any comments on how to test the robustness of the transition risk classifications?

Q28: Do you have any comments on the advantages and disadvantages regarding both the sectoral and the firm-level classification approach?

Q29: What approach should be preferred? Why?

Q30: Which equity index should be selected in terms of geography and size of the constituents to assess transition risk exposures? Why?

Q31: What are your views on applying a constant or changing composition of constituents regarding the equity portfolios? How material would the deviation between the two approaches be?

Q32: Do you agree that a static measurement of transition risk is sufficient? If not, can you suggest relevant data sources to implement a dynamic measurement?

Q33: Do you consider it necessary to isolate the effect of transition risk materializing in the observed historical equity risk of firms from other risk drivers from a prudential perspective?

Q34: Do you have any suggestions how to isolate the pure transition risk effect on equity risk?

Q35: Do you have comments on the approach for treating missing data?

Q36: Are there specific issues with missing data for non-listed equities? How should they be solved?

Q37: Do you have comments on the proposals regarding calculating the equity portfolio's value?

Q38: Are there specific considerations that apply for non-listed equities?

Q39: Do you have comments on the selection of periods for assessing equity risk?

Q40: Do you have comments on the measurement of equity risk if no adjustment for transition risk is performed?

Q41: What is your view on the merits of the absolute vs. relative approach? Why?

Q42: Which bond indices could be a suitable source for traded bonds? Why? Are there other relevant sources for traded debt?

Q43: Do you have any comments on the considerations regarding maturities and credit ratings for the analysis of transition risk?

Q44: What could be suitable sources for data on non-traded debt?

Q45: Do you have comments on the use of spread data provided by index providers for the analysis?

Q46: Do you think that a simple or a market value weighted spread should be used? Why?

Q47: Do you have comments on the selection of relevant time periods for the analysis?

Q48: Do you have any suggestions how the similarity of different portfolios in terms of modified duration could be measured?

Q49: What are the possibilities to account for the effect of duration/remaining maturity other than defining maturity/duration buckets? How would this work?

Q50: How could risk be measured for non-traded debt?

Q51: If there is a link between a building's energy efficiency and its market value, what are the economic drivers for this link?

Q52: Do you have quantitative evidence on the potential link between a building's energy efficiency and its market value on EU housing markets?

Q53: Are Energy Performance Certificates an appropriate measure for transition risk on residential and commercial real estate markets?

Q54: Do you expect different findings regarding potential risk differentials for commercial and residential buildings? Why?

Q55: What are typical characteristics of commercial and residential buildings influencing their market values and therefore should be controlled for when constructing price indices?

Q56: What are the benefits or disadvantages constructing a price index on hedonic regression analysis or simple price averages for the purpose of studying potential risk differentials?

Q57: What are potential data sources for the purpose of the study, i.e. data containing the market value of a building, a measure of its level of energy performance and further value driving characteristics?

Q58: What are the benefits or disadvantages using advertisement data for the purpose of this study?

Q59: Besides transition risk, climate-related physical risk exposures might also influence property risk. Do you have evidence in this regard and what data sources are available to study this potential link?

Q60: Do you have suggestions for other forward-looking assessments of transition risk that will help EIOPA in studying transition risk differentials? If yes, please provide these suggestions.

Q61: Do you have comments on using the sectoral transition vulnerability factors (TVFs) introduced by DNB (2018) as a forward-looking measure regarding transition risk?

Q62: Do you have comments on the parsimonious and pragmatic way to map the transition vulnerability factors (TVFs) onto the NGFS climate scenarios?

Q63: Do you agree that whether an activity is aligned or not with the (climate mitigation) taxonomy does not allow per se to draw conclusion on the vulnerability to transition risk? If not, please justify your view.

Q64: Do you agree with the proposed approach to express transition risk differentials for different economic activities in terms of 0.5% value at risk (VaR)? If not, please provide your suggestions to improve the proposed approach.

Q65: Do you agree that the forward-looking assessment should also consider commercial and residential property based on energy efficiency labels? Please explain your answer.

Q66: Do you have any suggestions that will help EIOPA in projecting forward-looking prices of commercial and residential property based on energy efficiency labels in different transition scenarios?

Q67: Do you have comments on the expected conceptual impact of adaptation measures on premium, reserve and natural catastrophe risk in Solvency II?

Q68: For internal model users, is it correct that climate related adaptation measures are not explicitly taken into account in your Solvency II internal model calculations for non-life risks?

If no, please provide details on your internal models results with and without taking into consideration climate-related adaptation measures.

Q69: Do you have evidence on the impact of climate-related adaptation measures on premium risk?

Q70: Do you have comments on the proposed methodology to study the potential impact of climate-related adaptation measures on premium risk under Solvency II's Standard Formula?

Q71: What do you consider to be areas where the prudential treatment of social risk and objectives should differ most from the treatment of climate risk and objectives?

Q72: Do you have comments on the working definition of social objectives, which are generally referred to as 'social and employee matters, respect for human rights, and anti-corruption and bribery matters' and can be articulated further by referring to decent work, adequate living standards and inclusive communities? Do you consider that social objectives should include anti-corruption and bribery matters, or are these governance aspects?

Q73: Do you have comments on the mapping of social risks into prudential risks?

Q74: Do you have additional examples of how social risks can translate into the Solvency II risk categories?

Q75: Do you have comments on the proposal to start by integrating the treatment of social risks as part of Pillar II and III of Solvency II, covering governance, risk management and reporting/disclosure requirements?

Q76: What do you consider good practices for addressing social risks as part of the ORSA?

Q77: Do you think that particular guidance would be helpful for addressing social risks as part of the ORSA?

Q78: What type of risk management actions are most relevant to address social risks?

Q79: How do social risks typically impact on business planning (3-5 years) or long-term strategy?

Q80: The taxonomy regulation includes key international standards on social issues as minimum safeguards (Article 18) in order to prevent environmentally sustainable activities from harming fundamental human rights, workers’ rights or principles of good governance (such as anti-bribery measures, for example). Would you agree that such minimum social safeguards could be used as guiding principles for implementing the prudent person principle requirement for investments with regards to social factors?

Q81: Similarly to EIOPA’s ongoing analysis on the integration of climate change adaptation into underwriting practices, do you see value in conducting further analysis on how insurers, through their underwriting activity, can include mitigation and adaptation measures for social risks in their underwriting strategy in an actuarial risk-based manner?

Q82: What are your views on the potential role of - and potential prudential relevance of - corporate governance aspects, such as remuneration, board composition or ant-corruption & anti-bribery tools to reduce potential social risks?

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EIOPA

Westhafen Tower, Westhafenplatz 1

60327 Frankfurt – Germany

Tel. + 49 69-951119-20

info@eiopa.europa.eu

https://www.eiopa.europa.eu