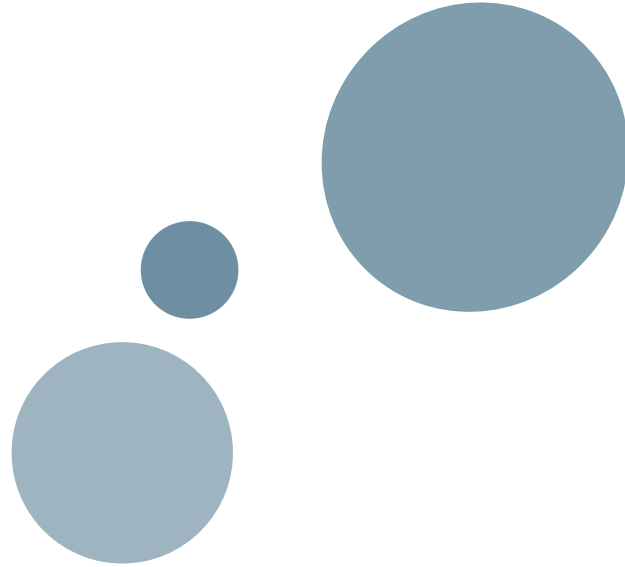


-  **Green and Sustainable**
-  Finance Cluster
-  Germany



TCFD Think Tank

Outlook: Shared Socioeconomic Pathways (SSPs)

**Narrative for Next
Generation Scenarios**

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Symbols



Definition



Further Reading



Key Message



Beispiel



Food for Thought

Abbreviations

IAM	Integrated Assessment Models
IPCC	Intergovernmental Panel on Climate Change
RCPs	Representative Concentration Pathways
SSPs	Shared Socioeconomic Pathways
TCFD	Task Force on Climate-Related Financial Disclosures

Foreword Green and Sustainable Finance Cluster Germany

Transparency is fundamental to evaluating risks and allocating capital efficiently. For this purpose, the consistent disclosure of financial results, the handling of opportunities and risks, the presentation of the situation and the making of forecasts are indispensable. This also applies to understanding the effects of the climate crisis.

The analysis of climate-related risks is challenging, as neither the exact path to a world compatible with the Paris Agreement nor the exact timing and extent of the physical effects of the climate crisis can be predicted. Many actors are only slowly recognising the significance of the climate crisis for their future economic success. In fact, changes due to the climate crisis affect all parts of the global economic system. The associated changes not only represent a considerable risk, but also open up new business opportunities for companies that are strategically consider the climate crisis. Risk/return profiles in the lending business and in asset management will change considerably as a result of the climate crisis. They are a result of the physical effects of climate change, climate policy and regulation, changing demand structures and new emerging technologies. Avoiding climate-related risks will prove difficult in certain asset classes or sectors, which may lead to a revaluation of such activities.

The Financial Stability Board has set up an industry-led Task Force on Climate-related Financial Disclosures (TCFD) to assess information relevant to climate-related risk. The TCFD has issued recommendations for the voluntary and consistent disclosure of climate-related financial information. These are intended to help investors, lenders and insurance companies understand significant climate-related risks and opportunities. Globally, the TCFD recommendations are now understood as a guideline and numerous companies have committed themselves to their implementation.

The Green and Sustainable Finance Cluster Germany e.V. (Cluster) showed in its Baseline Report published in August 2018 that the TCFD recommendations seem too abstract for German financial institutions. There is little understanding of practical implementation approaches of the TCFD recommendations. The cluster has therefore established a think tank for practical implementation issues in cooperation with experienced financial market practitioners. This is supported by the concentrated knowledge of the Frankfurt School of Finance & Management, PwC Deutschland, d-fine and right. based on science.

Within the framework of the TCFD Think Tank, four workshops were held with selected financial market practitioners. In the course of this process, a deeper understanding of the TCFD recommendations was built up. The findings are now made available to the interested public, in particular financial institutions, in the form of handouts. They are tailored to the needs of practitioners in order to independently advance the implementation of the TCFD recommendations.

1 SOCIO-ECONOMIC CONDITIONS

The Intergovernmental Panel on Climate Change (IPCC) has identified several uncertainties as sources of Climate-related risks, including:

1. Form and strength of climate change as a physical force
2. The ability of humanity to cope with the physical consequences of climate change. According to numerous studies¹, the latter plays a decisive role: favourable socio-economic conditions function as a protective shield against the consequences of climate change, while unfavourable socio-economic conditions tend to increase difficulties for climate action.

The influence of socio-economic conditions on the financial implications of climate-related risks is, however, only considered marginally by financial market actors in the early implementation of the TCFD recommendations. In practice, a consistent application of these conditions would mean that the emission reduction requirement to achieve a specific climate target would have to be included in the scenario analysis under several sets of socio-economic factors.

1.1 THE CONCEPT OF SSPS

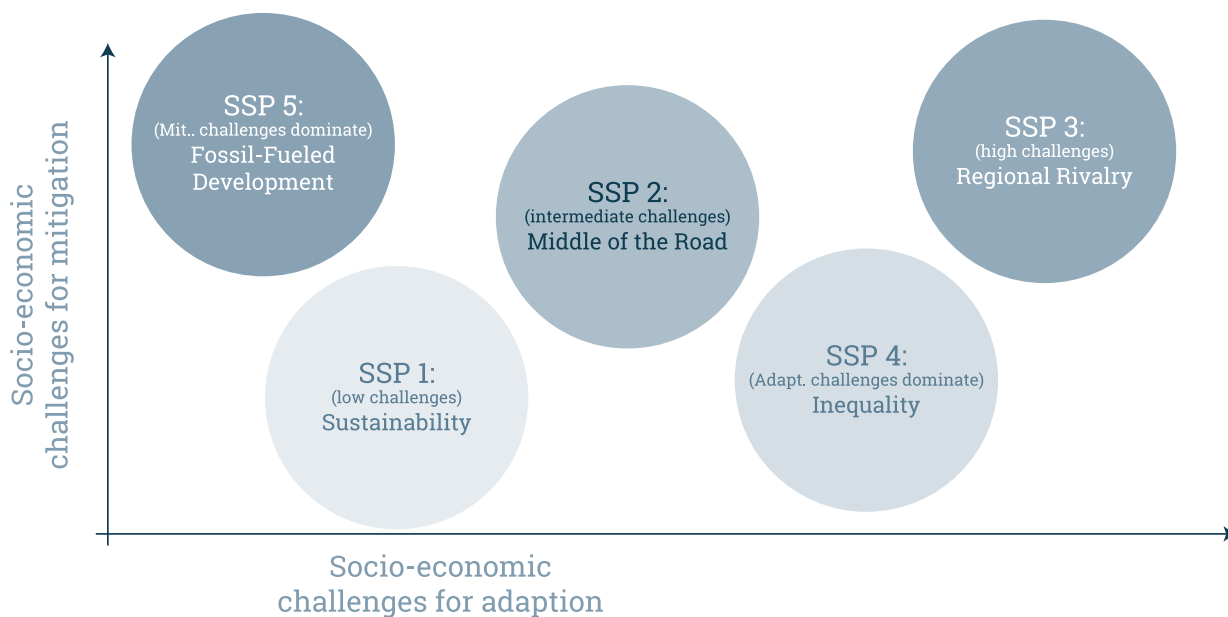
The Shared Socioeconomic Pathways (SSPs) are a frequently used concept for the consideration of socio-economic conditions in science. The SSPs were developed by a group of scientists² with the aim of simplifying the holistic consequences and dimensions of climate change while still providing a representative study. Climate change impacts are to be placed in the context of vulnerabilities and the possibilities for adapting and mitigating climate change. The following questions should be asked:

- Along which socio-economic pathways can the world community fundamentally develop?
- What consequences do the individual socio-economic development paths have for climate change and the risks it entails?

Five SSPs have been developed along these lines, which are influenced by various socio-economic drivers such as the development of the global community (e.g. level of education), the economy and lifestyles, regulation and institutions, technology and the environment, and natural resources.

1 most recently, for example, in determining the country-specific social cost of carbon and thus the financial consequences of climate change

2 ICONICS (International Committee On New Integrated Climate change assessment Scenarios)



SSP1: Sustainability

The world community is moving on a sustainable path because the importance of sustainable structures for a healthy economy and society has been recognised. Challenges to reduce emissions are low, as are the challenges of adapting to climate change.

SSP2: Middle of the road

The world community is evolving along historical lines. The challenges of reducing emissions are moderate, as are the challenges of adapting to climate change.

SSP3: Regional rivalry – A rocky road

The international community is characterized by increasing nationalism, conflicts and difficult cooperation between global institutions. Challenges to reduce emissions are high, as is the challenge of adapting to climate change.

SSP4: Inequality – A road divided

High inequality runs through the social, economic and political systems of the world community. The challenges of reducing emissions are low, but the challenges of adapting to climate change are high.

SSP5: Fossil-fueled development – Taking the highway

The belief in technology as a miracle weapon against climate change sets investment and development priorities for the global community. The challenges of reducing emissions are high, but the challenges of adapting to climate change are low.

Source: <https://www.sciencedirect.com/science/article/abs/pii/S0959378015000060> p. 2, Fig. 1

The SSPs will play an increased role in the upcoming IPCC 6th Assessment Report. The chapters on scenarios of a < 2°C world in particular benefit from the additional knowledge on how socio-economic conditions influence the achievement of climate goals.

The Progress Report

The Intergovernmental Panel on Climate Change regularly summarises its findings on the human influence on climate and the resulting implications in progress reports. They serve as an information basis for international environmental and climate-relevant decision-making. The most recent report is the 5th progress report from 2014/2015, the 6th progress report will be published in the period 2021 to 2022.

1.2 SCENARIO ANALYSIS WITH THE SSPS

The SSPs themselves are narratives. They can serve as a starting point for quantifying alternative socio-economic future scenarios through various Integrated Assessment Models (IAMs). IAMs combine energy and land use systems with socio-economic factors and climate models to create climate-related scenarios. These serve as the basis for the analysis of the financial implications of climate-relevant risks under the TCFD. These include, for example, scenarios for the transition to a <2°C world or climate-related business as usual scenarios. Among other things, the IAMs quantify the amount of emissions associated with a particular socio-economic pathway. In SSP1, sustainable lifestyles generate fewer emissions than in SSP5, in which fossil fuels play a central role in a society that continues to be climate-unconscious. In scenario analysis, all SSPs represent baseline scenarios.

Baseline Scenario

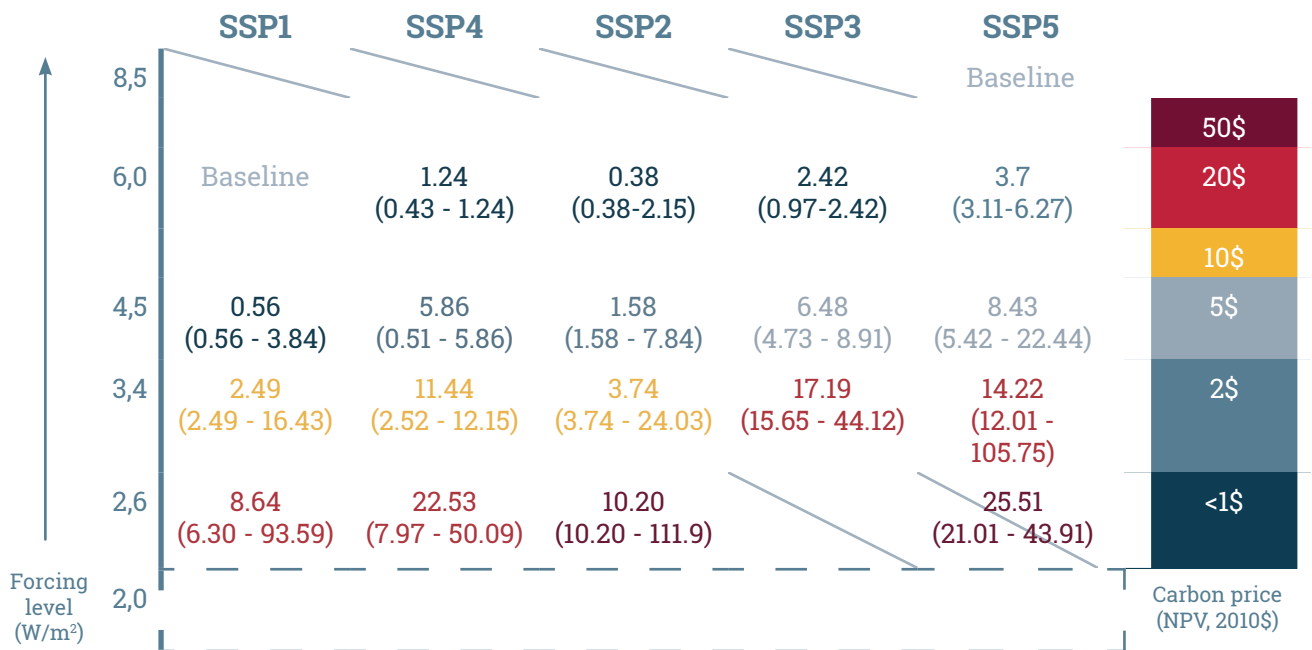
The SSPs are baseline scenarios, as they show how emissions would develop without climate regulation under different pathways. Working with baseline scenarios allows evaluating the effectiveness of climate measures by comparing the results of a scenario analysis with and without climate measures (baseline).

To describe the challenges that each SSP faces in achieving a climate objective, the SSPs are placed in a matrix of Representative Concentration Pathways (RCPs)³.

³ van Vuuren, D.P., Kriegler, E., O'Neill, B.C. et al. *Climatic Change* (2014) 122: 373. <https://doi.org/10.1007/s10584-013-0906-1>;

The RCPs describe selected emission pathways and their consequences for the so-called radiative forcing as a core element of the greenhouse effect and thus of global warming. The RCPs x SSPs approach is becoming increasingly important in the scientific community⁴.

For example, the matrix structure allows the costs for achieving a 2°C target (RCP 2.6)⁵ to be differentiated depending on the respective SSP. The following graph shows the results of a study by Riahi et al (2017) on the costs associated with the transition to a 2°C scenario from each individual SSP. In SSP1, these median cost indications are significantly lower than in SSP 4.



Quelle: <https://www.sciencedirect.com/science/article/pii/S0959378016300681> S. 164, Fig 8

The central objective of the TCFD recommendations is to create transparency with regard to climate-related risks and comparability between reporting companies. The matrix structure can support this goal by creating comparability of scenarios that can be used to analyse climate-related opportunities and risks. These can be clearly located in the matrix and thus create transparency with regard to the underlying scenario assumptions. For example, when comparing the results of different scenario analyses on climate-related opportunities and risks, it should be possible to see whether these are also based on the same set of assumptions. If one analysis is based on SSP2 x RCP 2.6 and the other on SSP5 x RCP 2.6, results are not fully comparable. Thus, the RCPs x SSPs matrix supports a consistent evaluation of climate-related aspects along the TCFD recommendations.

4 <https://www.carbonbrief.org/explainer-how-shared-socioeconomic-pathways-explore-future-climate-change>

5 The Representative Concentration Pathways (RCPs) describe emission pathways associated with a specific temperature increase. They are expressed in watts/square metre as a unit for the radiation propulsion that causes the greenhouse effect. The RCP 2.6 describes an emission pathway that conforms to a 2°C temperature increase.

1.3 EMBEDDING THE SSPs IN THE TCFD RECOMMENDATIONS

In the TCFD recommendations, the SSPs are not yet explicitly discussed as part of the scenario analysis. The increased use of the SSPs within the scientific community, especially in the IPCC's next progress report, suggests that SSPs are also gaining in importance within the TCFD recommendations. Scenario ensembles (i.e. plausible variance of scenarios) resulting from the RCPs x SSPs scenario framework should contribute to the inclusion of several < 2°C scenarios in the scenario analysis⁶.

With the central availability of data on the scenario ensembles, the financial sector has the opportunity to define plausible areas of uncertainty⁷. The exploration of such spaces makes it possible to build up competence towards development pathways leading to the transition to a <2°C world.

The SSPs introduce socio-economic conditions into scenario analysis. So far, this feedback loop has been little considered within the TCFD. The extension of the current models by the socio-economic dimension thus offers great potential for the necessary balance and significance of climate-related scenario analyses, which should serve as an information basis for important investment decisions.

6 <https://www.carbonbrief.org/explainer-how-shared-socioeconomic-pathways-explore-future-climate-change>

7 <https://tntcat.iiasa.ac.at/SspDb/dsd?Action=htmlpage&page=10>

ANNEX I: THE SSPs IN THE TCFD RECOMMENDATIONS

Even though there are no explicit examples of SSP applications from the financial industry yet, applications from other areas clearly demonstrate the benefits of SSPs for the financial industry. For instance:

- Rogelji et al. (2018)⁸: The study investigates how a 1.5°C world can be achieved with the result that the socio-economic conditions are decisive. For example, high social inequalities or a weak climate policy are exclusion criteria for the possibility of creating the transition to a 1.5°C scenario.
- The authors investigated the possibility of achieving the 1.5°C target under five different SSPs. The inclusion of the SSPs allowed them to make statements about the socio-economic conditions under which it is easier or more difficult to deal with the effects of climate change and to implement emission reduction measures.
- Byers et al. (2018)⁹: The study examines the impact of climate change on poverty-prone societies depending on different socio-economic conditions. It concludes that the vulnerability of such a society to climate-related risks under a 2°C temperature rise is many times higher under SSP3 (Regional Rivalry) than under SSP1 (Sustainability).

⁸ Rogelji et al. Scenarios towards limiting global mean temperature increase below 1.5 °C. Nature Climate Change volume 8, pages 325-332 (2018)

⁹ Byers et al. Global exposure and vulnerability to multi-sector development and climate change hotspots. Environmental Research Letters, Volume 13, Number 5 2018

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