Frequently Asked Questions

S&P Net Zero 2050 Carbon Budget Indices

Company Background

1. **Who is S&P Dow Jones Indices (S&P DJI)?** S&P Dow Jones Indices (S&P DJI) is the largest global resource for essential index-based concepts, data and research, and is home to iconic financial market indicators, such as the S&P 500® and the Dow Jones Industrial Average®. More assets are invested in products based on our indices than products based on indices from any other provider in the world. Since Charles Dow invented the first index in 1884, S&P DJI has been innovating and developing indices across the spectrum of asset classes, helping to define the way investors measure and trade the markets.

2. **Who is S&P Global Trucost?** S&P Global Trucost is a leader in carbon and environmental data and risk analysis, and it assesses risks relating to climate change, natural resource constraints and broader environmental, social and governance (ESG) factors.

S&P Net Zero 2050 Carbon Budget Indices

3. **Can you describe the methodology in short?** The indices are based on the concept that all types of financing can replicate the remaining global carbon budget as published by the Intergovernmental Panel on Climate Change (IPCC). In the IPCC's most recent report, the remaining global carbon budget of 300 $GtCO_2$ in 2020 would be necessary in order to achieve a 1.5°C objective by 2050, with an 83% probability and a starting point of 31.5 $GtCO_2$. Accordingly, there is a starting point (31.5 $GtCO_2$), an endpoint (2050) and a budget (300 $GtCO_2$) to spend between these two points.[1]

   In short, starting in 2022, S&P DJI will allocate a carbon budget each year (each new index will reflect a decarbonization trajectory based on the then-current remaining carbon budget) among index constituents based on their emissions. The total index

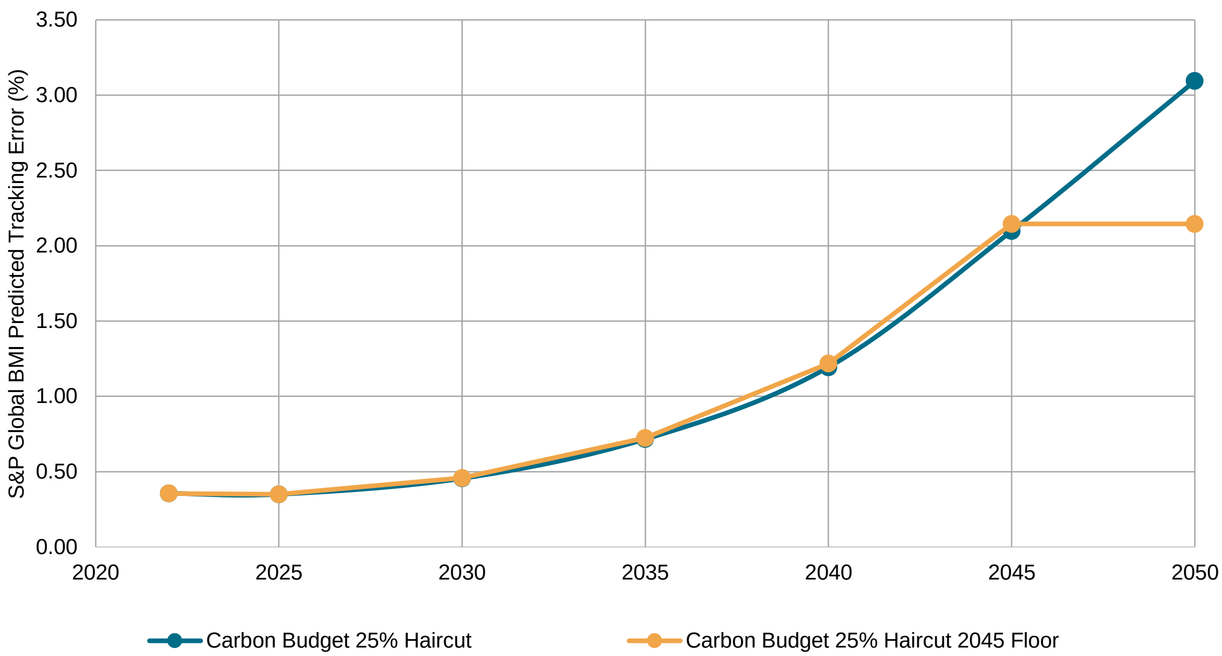
[1] IPCC, 2021: Summary for Policymakers. In: *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 3−32, doi:10.1017/9781009157896.001.https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_SPM.pdf.

carbon emissions will mirror the trajectory necessary to be carbon neutral at the planet's level (i.e., in 2022, to meet 1.5°C climate objective, this equates to an initial 25% emissions reduction, followed by a 10.1% reduction each year until 2050).

The market impacts are limited in terms of tracking error and the number of stocks at inception. The tracking error and stock count are anticipated to deviate from the underlying index over time. It becomes increasingly challenging to be carbon neutral if the world and underlying index do not decarbonize, but a decarbonization floor (which is not included in the current methodology) may reduce the impact.

As the carbon budget shrinks with time, new indices may be launched in the future for new entrants that will incorporate a decarbonization pathway using the remaining carbon budget based on then the current IPCC report.

Exhibit 1: Tracking Error Estimates of the S&P Global Net Zero 2050 Carbon Budget (2022 Vintage) Index relative to the S&P Global BMI, with and without a 2045 Floor



Source: S&P Dow Jones Indices LLC. Data as of July 2022. Chart is provided for illustrative purposes.

4. **What are the S&P Net Zero 2050 Carbon Budget Indices?** The indices are designed to measure the performance of eligible equity securities from an underlying index, selected and weighted to target a defined carbon budget and from each index's launch year (Vintage Year) to 2050, based on the IPCC's estimate for worldwide emissions to limit global warming from pre-industrial levels to 1.5ºC with an 83% probability.[1]

5. **Why were the S&P Net Zero 2050 Carbon Budget Indices created?** The indices aim to reduce the carbon ownership of an index in correspondence with the carbon budget from the IPCC, with an 83% chance of limiting warming to 1.5ºC by applying the decarbonization pathway that would be needed by the world at the index level, using S&P Global Trucost data.

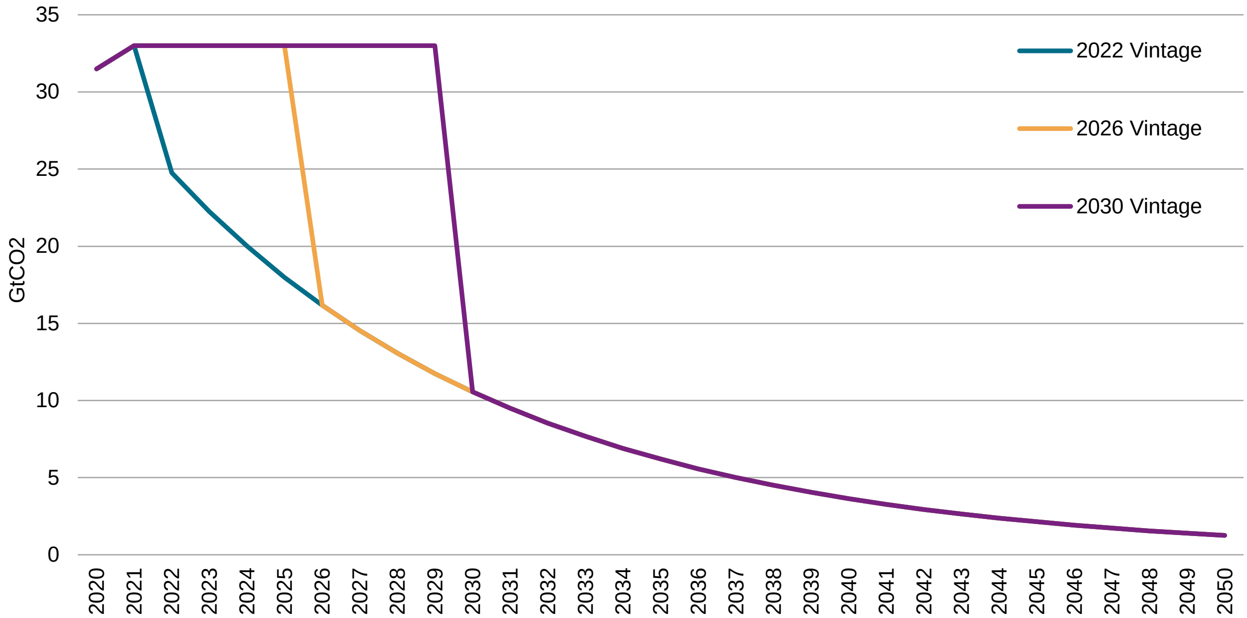
6. **What is the significance of the Vintage Year?** The Vintage Year refers to the year in which the index is constructed according to the methodology. A different vintage year will result in a changed decarbonization rate. For example, the S&P Net Zero 2050 Carbon Budget Indices (Vintage 2022) will likely have a lower decarbonization rate than the S&P Net Zero 2050 Carbon Budget Indices (Vintage 2025).

   The planet has an estimated carbon budget of 300 $GtCO_2$ from 2020[1] to limit global warming from pre-industrial levels to 1.5ºC with an 83% probability. If the planet continues to consume its carbon budget at a rate greater than would be required to remain within the carbon budget, the required rate of decarbonization will grow. As the S&P Net Zero 2050 Carbon Budget Indices are based on the planet's carbon budget, the decarbonization rate for each new vintage is expected to grow accordingly.

7. **What are the implications of utilizing a previous year's vintage (e.g., using the 2022 vintage in 2024)?** The S&P Net Zero 2050 Carbon Budget (2022 Vintage) Indices select index constituents to be collectively compatible with a decarbonization pathway by 2050, which is informed by the most recent report published by the IPCC and has an 83% chance of limiting warming to 1.5ºC. However, any index-based portfolio or strategy tracking the S&P Net Zero 2050 Carbon Budget (2022 Vintage) Index may not be able to make the same decarbonization and net zero 2050 commitments for an investment made in a year other than 2022. This is because the rate of decarbonization is expected to increase as we get closer to 2050. Exhibit 2 illustrates an increasing initial decarbonization reduction that would be necessary if the index-based portfolio or strategy tracking the S&P Net Zero 2050 Carbon Budget (2022 Vintage) Indices were entered into at any point beyond 2022. The exhibit 2 assumes that the world will continue to emit carbon at the current rate (33 $GtCO_2$ according to the IEA).[2]

[2] International Energy Agency (IEA). Global Energy Review 2021: Assessing the effects of economic recoveries on global energy demand and CO2 emissions in 2021. https://iea.blob.core.windows.net/assets/d0031107-401d-4a2f-a48b-9eed19457335/GlobalEnergyReview2021.pdf.

Exhibit 2: Pathway Based on Entry Point into S&P Net Zero 2050 Carbon Budget (2022 Vintage) Indices



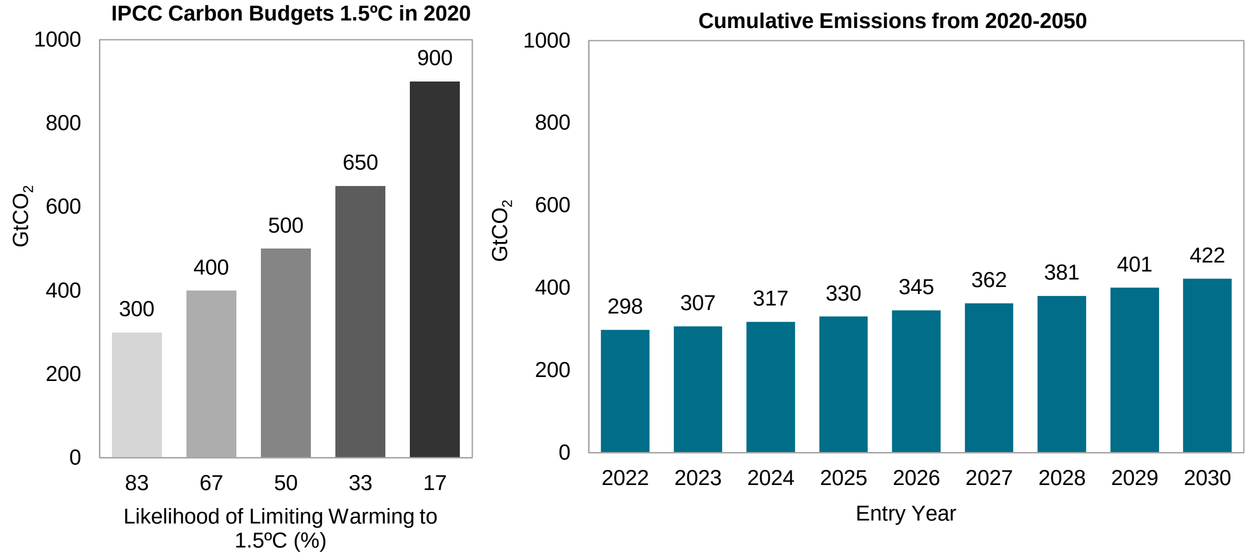
Source: S&P Dow Jones Indices LLC. Data as of July 2022. Chart is provided for illustrative purposes.

Exhibit 2 reflects the cumulative carbon emissions detailed in Exhibit 3. Accordingly, if a prior year's vintage index is used, the investment may not be aligned with the carbon budget from the IPCC, with an 83% chance of limiting warming to 1.5ºC.

However, an exception to this rule would be if the world accelerated decarbonization to a point at or greater than the decarbonization rate embedded within the S&P Net Zero Carbon Budget (2022 Vintage) Index (10.1% year-on-year, with a 25% initial reduction).

Launching an index series aligned with the then-applicable annual carbon budget highlights the need for action in the near term. However, the challenge for any index-based portfolio or strategy tracking this index series would be whether to permit access in a year other than the index vintage year for the aforementioned reasons.

Exhibit 3: Cumulative Emissions Based on Entry Point into S&P Net Zero 2050 Carbon Budget (2022 Vintage) Indices



Source: S&P Dow Jones Indices LLC, IPCC. Data as of July 2022. Charts are provided for illustrative purposes.

8. **What ESG datasets are used in the S&P Net Zero 2050 Carbon Budget Indices Methodology?** These indices utilize carbon emissions data from S&P Global Trucost.

9. **What indices are in the series?** There are regional variants based on the S&P 500, S&P Global BMI, S&P Europe BMI and S&P Developed BMI. The methodology is flexible and can likely be used in association with other diversified indices.

10. **When are the indices rebalanced?** The indices are rebalanced annually, effective after the close of the third Friday of March.

11. **How are the indices aligned with a net zero scenario?** The index methodology utilizes an optimization to target the cumulative Scopes 1, 2 and 3 greenhouse gas (GHG) emissions of the index remain below the 1.5ºC carbon budget, with an 83% probability as outlined by the IPCC's 2021 report.[3]

12. **Does S&P DJI have other indices aligned with net zero?** Yes, we have the S&P PACT™ Indices (S&P Paris-Aligned & Climate Transition Indices), which are a multifaceted approach and use the EU's minimum standards for Climate Transition Benchmarks and EU Paris-aligned Benchmarks to be carbon neutral.

[3] IPCC, AR6 Climate Change 2021: The Physical Science Basis.

13. What are the differences between S&P DJI's different net zero index offerings?

Exhibit 4: Index Construction

Category	S&P Net Zero 2050 PACT Indices	S&P Simple Net Zero 2050 PACT Indices*	S&P Net Zero 2050 Carbon Budget Indices
Net Zero Alignment			
Fixed Decarbonization Pathway	✓	✓	
Base Year-Adjusted Decarbonization Pathway			✓
IPCC Report Based	IPCC 2018, with a 1.5ºC increase objective and 66% probability**	IPCC 2018, with a 1.5ºC increase objective and 66% probability**	IPCC 2021, with a 1.5ºC increase objective and 83% probability
Carbon Ownership Factor	EVIC	EVIC	Market Cap
EU PAB/CTB Compliant	✓	✓	
Net Zero Alignment + GFANZ Alignment* **			
Forward-Looking 1.5ºC Alignment (including sectoral pathways)	✓		
Science Based Target Considerations	✓		
TCFD Alignment****			
Physical Risk Considerations	✓		
Transition Risk Considerations (beyond decarbonization pathways)	✓		
Climate Opportunity Considerations	✓		
Additional ESG Incorporation			
S&P DJI ESG Score Incorporation	✓		
Environmental Exclusions	Paris-Aligned only	Paris-Aligned only	
Social Exclusions	✓	✓	
Controversy Exclusions	✓	✓	

* The S&P Simple Net Zero 2050 PACT Indices are not currently live.
** Incorporates an additional 30% or 50% carbon reduction on top of the required decarbonization trajectory from the base year.
*** Aligns with elements of the GFANZ Investment Portion of the Mechanisms of Change, presented in their 2021 report on Our Progress and Plan Towards a Net-Zero Global Economy.
**** Aligns with recommendations from the Taskforce on Climate-Related Financial Disclosures recommendations and climate-related financial risks and opportunities.
Source: S&P Dow Jones Indices LLC. Data as of July 2022. All indices incorporate Scopes 1, 2, and 3 GHG emissions. See the S&P PACT Indices and S&P Net Zero 2050 Carbon Budget Indices Methodologies for more information. Table is provided for illustrative purposes.

Exhibit 5: Index Outcomes

Metric	S&P 500	S&P 500 Net Zero 2050 PACT Indices		S&P 500 Net Zero 2050 Carbon Budget Indices
		Climate Transition Index	Paris-Aligned Index	2022 Vintage Index
Predicted Tracking Error (%)	-	1.36	2.35	0.26
Active Share (%)	-	25.58	32.05	3.81
Sector Active Share (%)	-	2.62	6.71	1.14
Effective Number of Shares	74.12	64.99	65.76	68.42
Stock Count	503	353	322	487
Weight in Top 10 Companies (%)	28.11	30.55	31.53	28.94
Temperature Alignment (Forward-Looking)	3°C	1.5°C	1.5°C	3°C
Physical Risk (High 2050 Scenario)	26.9	24.43	22.87	26.74
Fossil Fuel Reserves	470.57	203.72	0	456.15
Carbon Emissions (Scopes 1+2+3) / EVIC	223.07	144.14	101.02	178.82
Carbon Emissions (Scopes 1+2+3) / Market Cap	307.94	189.49	133.62	241.12
Carbon Emissions (Scopes 1+2+3) / Revenue	826.19	681.07	394.29	752.97
S&P DJI ESG Score	68.89	69.68	78.24	68.35

Source: S&P Dow Jones Indices LLC, S&P Global Sustainable1, and Axioma. Data as of August 2022. Index performance based on total return in USD. Past performance is no guarantee of future results. The indices studied were the S&P 500 Net Zero 2050 Climate Transition ESG Index, S&P 500 Net Zero 2050 Paris-Aligned ESG Index and S&P 500 Net Zero 2050 Carbon Budget (2022 Vintage) Index. Table is provided for illustrative purposes.

14. **What are the exclusions in the index?** There are no criteria-specific exclusions in the index. Under the optimization rules, firms may be given a zero weight in the index.

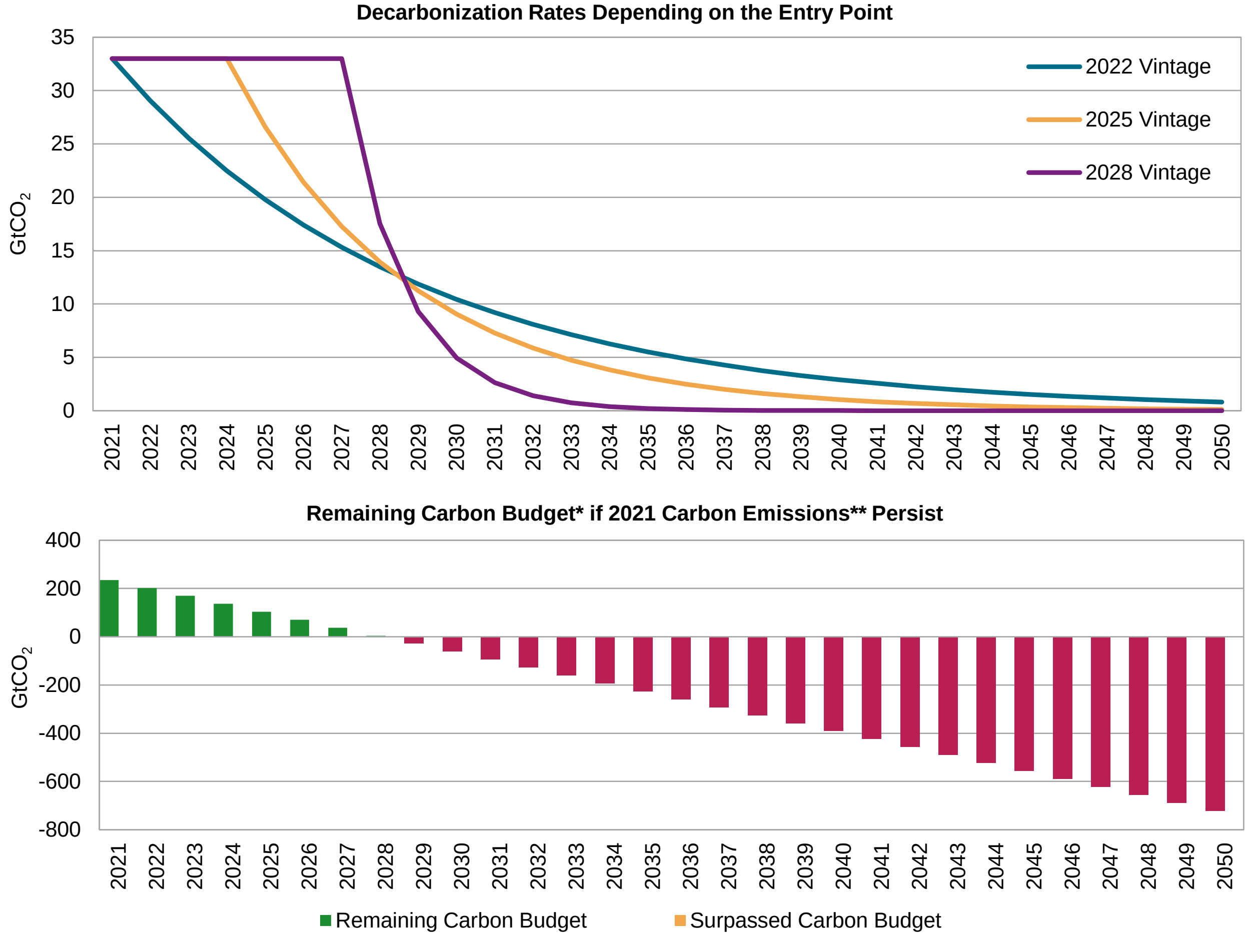
15. **Why is there no ESG score incorporation?** The S&P Net Zero 2050 Carbon Budget Indices purely target net zero GHG emissions exposure.

16. **What changes may occur from one Vintage Year to another?** If the global carbon budget continues to be consumed at current rates, we would expect the rate of decarbonization to increase over time until becoming infeasible once the carbon budget has been consumed in its entirety.

    It will not affect the S&P Net Zero 2050 Carbon Budget (2022 Vintage) Indices. However, unless the planet decarbonizes at a faster rate over time, new vintage indices within this index series will likely require a higher decarbonization rate.

    As an example, for the S&P Net Zero 2050 Carbon Budget Indices, carbon neutrality starting in 2022 means a -25% haircut followed by a 10.1% reduction per year. This may become a 25% initial haircut followed by an 18% reduction per year in 2025, if the world continues to emit carbon at current levels.

Exhibit 6: Decarbonization Rates Depending on the Entry Point and Remaining Carbon Budget Estimates



* 83% likelihood of limiting warming to 1.5º
** 33 $GtCO_2$
Source: S&P Dow Jones Indices LLC, and IPCC. Data as of July 2022. Charts are provided for illustrative purposes.

17. **Why is there no explicit inflation adjustment?** The index constituents have their total market cap adjusted by the index total return since the launch of the index, providing an embedded inflation adjustment.

18. **Is there an academic foundation or external comment for this index series?** The product is inspired by a paper that the Financial Analysts Journal published in March 2022, "Net-zero carbon portfolio alignment," Volume 82, Issue 2. It is co-written by Patrick Bolton (Columbia University), Marcin Kacperczyk (Imperial College) and Fred Samama (S&P Global Sustianable1).

    GFANZ also recently highlighted the decarbonization approach (which is central to the S&P Net Zero Carbon Budget Indices methodology) in its publication "Measuring Portfolio Alignment" (see page 10). This is available at www.gfanzero.com.

19. What is the carbon metric used in the S&P Net Zero 2050 Carbon Budget Indices?

The S&P Net Zero 2050 Carbon Budget Indices use the total index carbon emissions. Total index carbon emissions seek to measure the volume of emissions the index is responsible for based on the equity ownership of companies, defined as the sum of the equity ownership multiplied by the company's GHG emissions (Scopes 1, 2 and 3). This figure perfectly correlates with carbon intensity, where market cap is the denominator and Scopes 1, 2 and 3 carbon emissions the numerator.

The $Total\ Underlying\ Index\ Carbon\ Emissions_0$ is the total absolute emissions of companies in the underlying index as of the reference date of the first rebalancing, apportioned on an equity ownership basis, only capturing the share of each company's emissions in proportion to the share of each company's total market capitalization in the S&P Global BMI. It is calculated using the GHG emissions dataset provided by S&P Global Trucost[4] as follows:

$$\text{Total Underlying Index Carbon Emissions}_{t=0} = \sum_{i} \text{Underlying Index Equity Ownership}_{t=0,i} \times \text{Company Emissions}_{t=0,i}$$

where:

$\text{Underlying Index Equity Ownership}_{i}^{0}$ = the index market capitalization (after free-float adjustment) for all stocks of company *i* in the underlying index as of the reference date of the first rebalancing, as follows:

$$\text{Underlying Index Equity Ownership}_{i}^{0} = \frac{\text{Underlying Index Mkt Cap}_{i}^{0}}{\text{Total Mkt Cap}_{i}^{0}}$$

where:

$\text{Total Mkt Cap}_{i}^{0}$ = the total market capitalization (without free-float adjustment) for all the stocks of company *i* that are constituents of the S&P Global BMI as of the reference date of the first rebalancing.

[4] For information on S&P Global Trucost's methodology, please refer here.

$$\text{Company Emissions}_i^0 = \text{GHG1}_i^0 + \text{GHG2}_i^0 + \text{GHG3}_i^0$$

where:

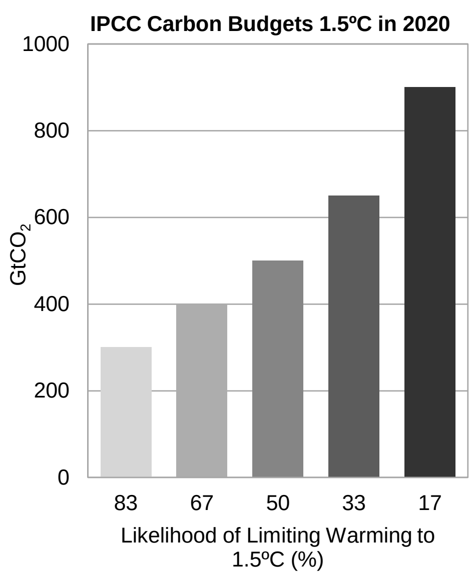
GHG1_i^0 = Scope 1 GHG emissions in tCO_2e for the company i as of the reference date of the first rebalancing.

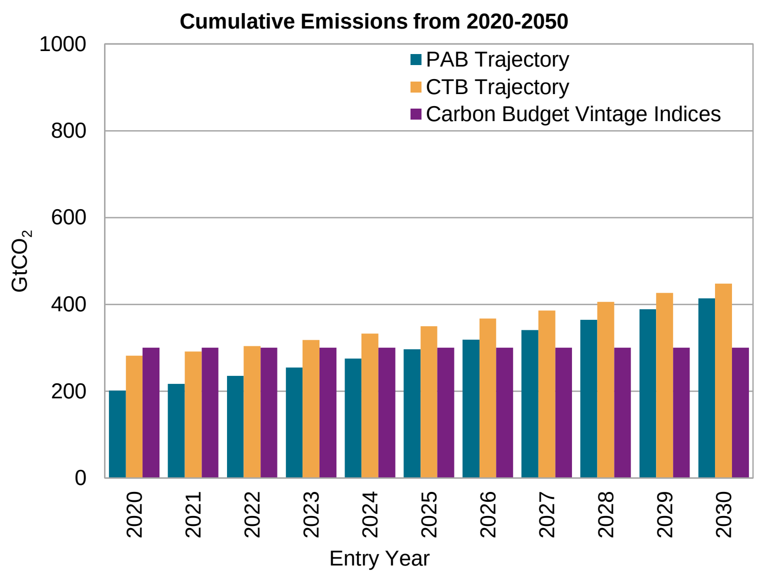
GHG2_i^0 = Scope 2 GHG emissions in tCO_2e for the company i as of the reference date of the first rebalancing.

GHG3_i^0 = Scope 3 (upstream and downstream) GHG emissions in tCO_2e for the company i as of the reference date of the first rebalancing.

20. **Are the decarbonization pathways of the S&P Net Zero 2050 Carbon Budget Indices more ambitious than the EU PABs or CTBs?** This is dependent on when an index-based portfolio or strategy tracking the relevant net zero index is entered. If the world were to take trajectories based on the entry point into the pathways used in indices, we could compare the cumulative emissions to the IPCC's carbon budgets for 1.5ºC. Indices aligned with the EU's minimum standards for the EU Paris-aligned benchmark decarbonization pathway will likely see greater than an 83% likelihood of limiting warming to 1.5ºC with an entry year before 2026, but a 7% year-on-year decarbonization may not align with 1.5ºC indefinitely if an investment occurs in the index-based portfolio or strategy tracking an EU PAB entered beyond 2026.

Exhibit 7: Compatibility with IPCC Carbon Budgets





Source: S&P Dow Jones Indices LLC and IPCC. Data as of July 2022. We assume the world continues to emit the same amount of emissions in 2022 ($33GtCO_2$) and the EU PABs or CTBs have a base year of 2020. Charts are provided for illustrative purposes.

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